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SUGAR IN THE HAWAIIAN ISLANDS.

"Sugar in the Hawaiian Islands.—The sugar lands of the Hawaiian Islands offer one of the best investments in the whole world. Of course planters have trouble, but with sufficient rains and without irrigation the average yield is three tons of sugar to the acre. With irrigation it is eight to twelve tons, ten tons being the average, and as ten tons of sugar at $3.62 1-2 per 100 pounds will bring $72.50 per ton or $725 per acre, it will be easily seen that there is hardly any obstacle that cannot be overcome.—The Investor."

The foregoing is but a fair sample of the many misleading statements concerning the sugar industry of Hawaii which appear from time to time in various papers and journals.

Were the facts therein stated true, there would indeed be hardly any obstacle in our sugar industry, which could not be overcome—even to the paying of dividends, which have been the more noticeable these past two years by reason of their absence.

It is probably a waste of time to refute such statements as they undoubtedly will continue to appear, but it is well perhaps to put ourselves on record.

Many of our plantations have, under favorable conditions—a good price for sugar, low price for labor and plenty of it—paid very well, but with the low price of sugar resulting from a greatly increased production of beet and cane sugar in the sugar-producing countries, the margin of profits has become very small.

Sugar can be produced at a profit in Hawaii only when cultivated and manufactured on a large scale, and the difficulties in establishing and carrying on a large plantation are very great.

More than two-thirds of the cane grown in the Islands is produced by artificial irrigation, and water for this purpose in quantities sufficient to justify engaging in cane culture can only be obtained from surface streams or by pumping from subterranean sources.

Owing to the nature of the formation of the Islands and of the rains, the exposed portions have been worn into deep gorges or gulches with high ridges between them; these gulches, in many instances are from hundreds to thousands of feet in depth with precipitous sides, and follow each other in close succession, with but small areas of land between suitable for cultivation.

For the most part the arable land is far removed from the sources of water supply, and to convey the water from the gulches in the rainy belt to the arid arable sections requires ditches of many miles in length and also flumes and pipelines to cross intervening gulches. Dams and reservoirs to impound the water are also constructed.

In obtaining water by pumping from below the surface powerful machinery of large capacity is required.

To procure an adequate supply of water the expense involved in the first instance ranges from $100,000 to $500,000, and heavy and continuous expense is incurred in maintaining the extensive water systems. The machinery, buildings and appliances necessary to manfacture sugar on a scale to justify the undertaking, costs from $100,000 to $500,000 and upwards, exclusive of the cost of the land.

Undoubtedly our soil is productive, and the yield is comparatively large on most of the plantations, but it is manifestly unfair to pick out one plantation where the yield averages ten tons of sugar per acre, and take that as the standard.

The average yield of all plantations since 1895 has been as follows:—

Sugar Yields of the Hawaiian Islands.

Year	Acres	Tons of Sugar	Yield per Acre			
1895	47399½	153,419½	6472	lbs.=3.236	short	tons
1896	55729	227,093	8148	" =4.074	"	"
1897	53825½	251,126	9331	" =4,665	"	"
1898	55235½	229,414	8306	" =4.153	"	"
1899	60308	282,807	3978	" =4.689	"	"
1900	66773	289,544	8672	" =4.336	"	"
1901	78618½	359,133	9136	" =4.568	"	"

Furthermore it must be borne in mind that from eighteen to twenty-four months elapse from the time the land is broken for planting until the harvesting is concluded. Planting is generally done in the summer months and grinding is begun about November of the following year, and finished about the following June. Thus the crops overlap. Moreover the fields cannot be continuously cropped, but must be allowed to lie fallow from time to time, and about three times the area of land is needed to maintain continuous yields than is required to produce an annual crop.

The cost of labor also is high—our labor troubles and experiences have been so often thrashed out and conclusions arrived at by those who thought they understood our situation that we will not enter into a discussion of the matter. Suffice to say, that so far as Europeans (except Portugese), and Americans, are concerned, it has been found that they were unfitted for field work and will not and can not perform such labor.

The average cost of production of sugar on sixteen representative plantations (joint stock companies issuing and printing annual reports) for the crop of 1901-1902 is found to be forty-nine dollars per ton of sugar at the mill; marketing expenses are from eleven and one-half dollars to fifteen dollars per ton, according to location. This average does not take into account any expenses for permanent improvements, but is derived solely from the operating expenses.

Of these sixteen plantations we find that for the year ending December 31, 1902:—

9 paid no dividends, some running behind.
3 paid 6 per cent. dividend.
1 paid 5 per cent. dividend.
2 paid 4 1-2 per cent. dividend.
1 paid 1 per cent. dividend.

The previous year's drought on portions of Hawaii and Maui affected the earning capacity of many plantations, but we have eliminated most of those so affected.

We trust that the foregoing may tend to show that producing sugar in these Islands at a profit, is not such a "cinch" as some may believe.

During the past few trying years, the difficulties which have arisen and the obstacles which have been surmounted, by our sugar men, have been such as to try the nerve of the strongest of men.

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HONOLULU ENGINEERING ASSOCIATION.

At the regular monthly meeting of the Honolulu Engineering Association held last month a number of interesting papers were presented and read, those on fuel oil by Mr. Perkins and Mr. Keech appear in this number.

The Association is composed of engineers and those engaged in engineering work and was organized for the purposes of advancing engineering knowledge among the members by the holding of meetings for the presentation and discussion of engineering subjects, and the acquisition and maintenance of an engineering library for the use of members.

The present officers of the Association are E. Kopke, Chairman; A. W. Keech, Vice-Chairman; T. H. Petrie, Treasurer; Robt. J. Pratt, Secretary; G. P. Denison, F. W. Beardslee and Marston Campbell, Directors.

ON THE SPECIFIC GRAVITY OF MOLASSES.

By Ernest E. Hartmann.

The density of molasses is usually found by dilution and subsequent spindling, or determination of the specific gravity of the diluted molasses by pyknometer.

This method, as I propose to demonstrate here, yields invariably results which show too high a specific gravity, the error increasing with the degree of dilution. The discrepancies between results obtained by different dilutions increase with the content of non-sugars in the molasses, and vary with the composition of the mineral contents.

In a solution of pure sugar the same density will be found by direct determination and by dilution.

Average analysis of the molasses used for the following comparisons:

Water	18.54	
Sucrose	35.44	(Direct Polarization 31.88)
Glucose	20.27	
Gums	3.10	
Other Organic Matter	10.80	
Ash	11.85	
	100.00	
Nitrogen	.523	
Alkalinity	.112 % Ca 0	

ANALYSIS OF ASH.

Ca 0	10.05
Mg 0	2.12
K_2 0	40.57
Na_2 0	4.62
Fo_2 0_3 / Al_2 0_3	1.84
P_2 0_5	1.40
S 0_3	13.62
Si 0_2	1.88
C 1	24.25
C 0_2 and diff	5.19
	105.54
0 equ. to Cl	5.54
	100.00

It was not practicable to expel the air entirely from the undiluted molasses. The highest concentration experimented with was for this reason 80 per cent. The specific gravity was determined by pyknometer for dilutions from 80 per cent. down to 10 per cent. The temperature was, as much as possible, kept the same.

As will be seen in the table below, the values for the different degrees of dilution lie in a fairly regular curve. The values for above 80 per cent. and below 10 per cent. (given in italics), have been estimated by extension of this curve.

—Dilution.—			
Molasses.	Water.	Per Ct.	Brix Degree.
100	*0*	*100*	*90.0*
80	20	80	90.37
70	30	70	90.60
60	40	60	90.91
50	50	50	91.31
40	60	40	91.80
30	70	30	92.38
20	80	20	93.06
10	90	10	93.84
1	*99*	*1*	*94.7*

The actual density as expressed in degrees Brix of the average molasses under consideration, would thus be found to be very near 90.0, while the Brix obtained by mixing 1 part molasses with 3 parts of water (the proportion most generally used in the laboratories in these Islands) would be 92.7, a considerable difference.

This peculiar behavior of the molasses must be ascribed to substances (mineral salts) held in suspension in the concentrated molasses, which, on mixing with water, are gradually dissolved. In fact, in most of the low-grade molasses which have so far come under my observation, I have found microscopical crystals, which are not readily dissolved by the addition of water.

The quotient of purity obtained by dividing single polarization by Brix as found by dilution method, is of value for the comparison of work in the same sugar house day by day, but for calculation of losses and comparison of work of different factories, sucrose should be determined by the Clerget method and total solids should be found by determination of water in molasses.

HIGH DILUTION AND USE OF COAL IN SUGAR EXTRACTION FROM CANE.

By J. N. S. Williams.

Assume that a factory when crushing cane and using an amount of water of maceration of 15 per cent. on the weight of the so-called normal juice, and fairly well equipped with evaporating apparatus, etc., just manages to keep up good steam with the bagasse resulting from the crushed cane.

Any increase in the amount of maceration involves the use of fuel (wood or coal) to keep steam—that is, to evaporate the excess of water. Since sugar factories are primarily established to make money, the question arises, at what point does the application of water of maceration to the cane in process of crushing cease to be economical?

With 15 per cent. maceration, the resulting weight of dilute juice recovered per ton of cane is about 1,850 pounds, and the extraction on weight of sugar in cane about 93 per cent. Suppose sufficient excess of water is applied to bring the weight of dilute juice up to 2,150 pounds per ton of cane, say a dilution of from 25 per cent. to 28 per cent. on weight of so-called normal juice, and corresponding to an extraction of, say 94.5 per cent.; there has been excess water amounting to 300 pounds per ton of cane added, and the extra sugar extracted amounts to the difference between 93 per cent. and 94.5 per cent., which in cane containing 15 per cent. of sugar, or 300 pounds per ton of cane, is equivalent to the difference between 279 pounds pure sugar and 283 1-2 pounds of pure sugar, or 4 1-2 pounds per ton of cane. This sugar is worth to the plantation *in the juice* not more than 2 1-4c per pound at present prices. The sugar to be recovered, then, by an application of 300 pounds of water is worth in round figures 10c per ton of cane. To evaporate 300 pounds of water will require not less than 25 pounds of coal, allowing 12 pounds of water per pound of coal (which is reasonable, considering the multiple effect of evaporation). Now, coal costs, delivered into the furnace, not less than 1-2c per pound, showing a dead loss of 2 1-2c per ton of cane ground, or $25.00 per day in a factory grinding 1,000 tons of cane.

When the factory is so equipped that it can use high dilution and keep within the natural fuel supply furnished by the cane, it is economical to macerate to this limit; but there is no money in burning coal at above price to evaporate excess maceration water.

From the foregoing it will be readily seen that where the sugar content in cane is low, say at 13 1-2 per cent. to 14 per cent. on cane weight, the loss in heavy maceration is greater than that given in illustration.

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LIQUID FUEL.

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Its Molecular Structure.

By Alvin W. Keech.

Energy is that which can and does produce change. It is known only by its manifestations.

Force is energy producing or about to produce change at some particular place and in some particular direction.

Work is the change produced by a Force acting. It is useful or useless.

Power or source of power is Force, passive or active, that can be controlled.

Time is a continual succession of infinite changes. It is a fluent with a uniform progression or increment.

Rate is the measure of the increment or progression.

Duration is the lapse or sum of the number of infinite increments between two particular events or changes.

Energy is a prime cause. It is the sum of all the activities above the zero potential. It is a fixed but unknown quantity.

When a considerable amount of work is done at one particular place, as when a quantity of combustible is consumed in an atmosphere of oxygen, then it is that the element of time enters into the action and determines whether it shall be a conflagration, an explosion, or the small, prolonged combustion of a lamp or stove.

Remember that the concussion, the noise and havoc of what we call explosion, are due solely to the shortness of time in which the work is done.

These definitions and notes have been put on the blackboard for your consideration, as they shall be used as reference in what follows.

The hydrocarbons, as we find them in petroleum, are an ideal fuel, making no clinker and leaving no ashes. They are in such a condition that complete combustion can be accomplished and smoke prevented, and, for that reason and others, they commend themselves to anyone who desires cleanliness, as well as utility; and it is safe to say that true cleanliness now pervades the every-day operations of mankind generally as it never did before. The combustion of liquid and gaseous fuels can be accomplished and controlled with more ease and greater certainty than the solid forms, and, as remarked, without dirt. They begin to give out their required quantity of heat at the touch of a hand when conditions and apparatus are right, and as quickly cease to do so at the closing of a valve. It is for these very good reasons that any of us requiring fuel, desire them, provided they can be gotten on a favorable commercial basis, together with the suitable apparatus for burning them. Safety also considered. There seems to be one great fault chargeable against them, and that is their so-called explosive nature, which we hope to learn is more apparent than real. Telling the average person that such combustibles as kerosene, gasoline and the like, do not explode, and never have exploded, has the same effect, I imagine, that a positive declaration of the roundness of the world would have had upon King Solomon, and we all know of his reputation for wisdom and several other accomplishments too numerous to mention. I have written a war cry, or slogan, on the board, so that as an improvement on old Scipio, I need not begin and end my speech with it.

Fuels, Liquid or Gaseous, Do Not Explode.

The liquid and gaseous hydrocarbons do not explode, and never have exploded. Like water, when they are liquid, even gaseous, you may subject them to any temperature below disintegration, with no different results from those attendant on water under like conditions—that is, if inclosed. They boil, produce vapor, make pressure, run engines and condense again to their liquid form; in fact, the more volatile ones in mixture, as naptha, are a better medium for converting heat into motion than is water. But—the "ifs" and "buts" are the stumbling blocks of our complex existence—every now and then up goes some container or tank loud in its explosion, terrible in its destruction—often attended by painful injury and death. Why? The question is proper, and it must be answered to your satisfaction. The innocence of the hydrocarbons must be established, or else I must rub the war cry from the blackboard. The person last seen with the murdered is generally the big red apple to the monkeys of the coroner's jury till a more suitable substitute can be found. The liquid fuel being most in evidence, is the first to fall under suspicion. It can be seen, felt, tasted and smelt, and after the explosion there it is burning with murderous intent, a ready-made scapegoat for blame, and the verdict of a quick conclusion. It is a victim of circumstances, but for all that, the assertion on the board will remain after having been proved true. Beside the war cry, I have put a few half home-made definitions of several other dramatis personae, who play a very important part either in combustion, or in explosion, which is merely instantaneous combustion. I have not looked sharply nor lately in any text-book for material for those definitions, and I shall be glad if they act as a chip on the shoulder to provoke criticism from the body of the house.

As I needed tools, it was thought best to forge them with points to suit the occasion, and there they are. There is no energy in carbon, neither in hydrogen, so there can be no force power or work, and consequently no explosion or destruction, with injury or death; and what do you say to that? You will find that the manifestation of energy becomes apparent only after the villain comes on the scene, and I have secured a numerous company of villains, which I will endeavor to show you in the act of making mischief; likewise getting other innocent fellows into trouble. We can hardly go further without having a glance at the fundamental principles of this affair of the "Average Man vs. Liquid Fuel."

It is assumed that the division of matter can be continued mechanically in theory down to single units, called molecules, which units are defined as the least quantity of any substance in which its qualities inhere. The molecule is the physical unit of any substance, and the aggregation of those small units makes the substance, as the unit brick, when in numbers, makes the wall. These molecular units are assumed to be composed of a different order of units called atoms, having entirely different ways of joining to form molecules. Obeying different laws: The molecule is one conception; the atom is another. Their relation to each other, as well as a mental conception of the two orders of units, is the great molecular theory by which it is sought to explain the phenomena of nature. The one is the physical unit and the other is the chemical unit, and they must not be confounded. These units, whether molecule or atom, must be extremely small, and it is said on good authority that if a drop of water were magnified to the size of the earth, its molecules consisting of one atom of oxygen and two atoms of hydrogen, would occupy a space between the size of bullets and cricket balls. Let us not bother about their shape or general appearance, for that is useless speculation. The whole molecular theory some day may be supplanted by a better one, but that there are certain small magnitudes which we now call atoms, will remain. They are our X and Y till we find better expressions for them. Some time ago a method suggested itself to me, so that by taking advantage of the hereditary monkey trait of observing things striking in form and color, I might more quickly and permanently impress upon my mind the formulae of these combinations; and here you have samples of the colored forms which are used in the method. I want to caution you that they mean *nothing more than an idiographic representation of the conception* of an atom so far as its weight and combining powers go. The colors and markings are to catch the eye and make an impression as well as a distinction. The forms suggest the combining power, or bonds by which they are clamped together. It is the representation in two dimensions, that is, on a plane, of what really takes place in three dimensions. Each atom of every elementary substance is accredited with a certain weight. The atoms of each elementary substance are assumed to be alike, so the weights of all atoms of one kind are alike. These weights are called the atomic weights, and are referred to the atoms of hydrogen as one, it being the lightest. The atomic weights of all the other substances are therefore heavier than that of hydrogen. With each kind of these colored geometrical forms, I ask you to associate a weight which becomes a useful number in proportion, producing definite results. That form having one point, showing that it has but one bond, or grasper, is colored blue arbitrarily, and represents the single atom of hydrogen; with it goes the weight 1. That form must now be fixed in your mind as representing the atom of hydrogen, but not the substance. There you see another form having six angles, two more prominent than the rest, which signifies that it is two-bonded, and may be at times six-bonded. With it I ask you to associate the number 16. It is colored red to indicate its fiery activity, and it stands for the single atom of oxygen, but not the substance.

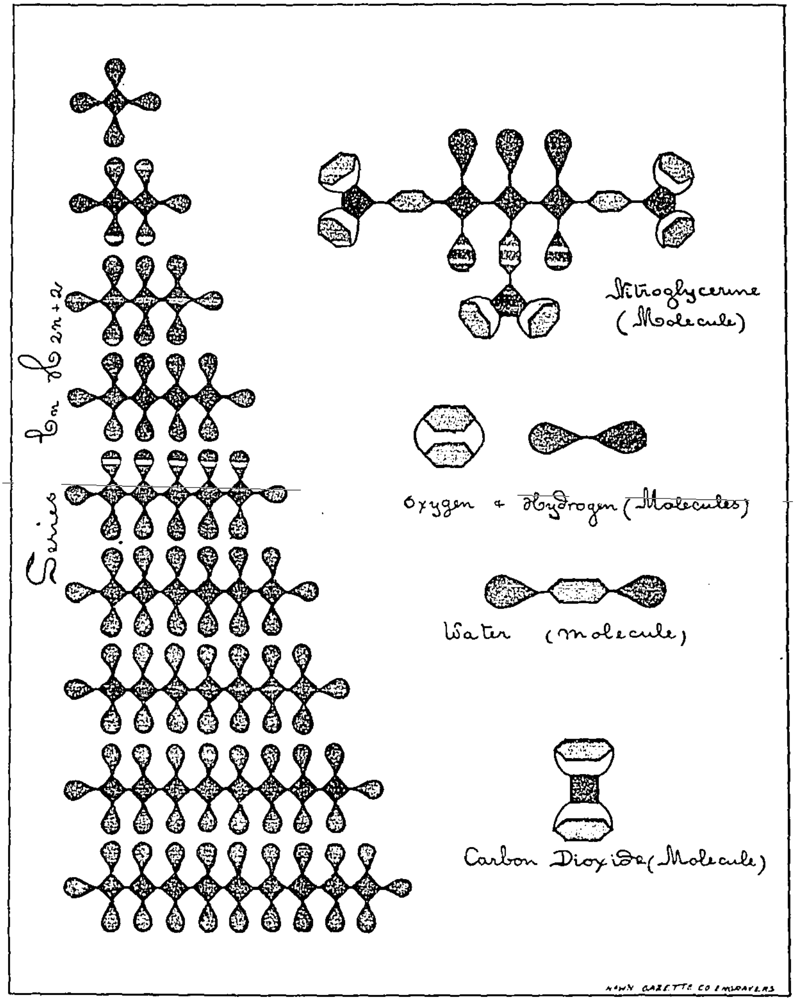
There again is the third form, a perfect square, showing by its four angles alike that it is four-bonded only; with it goes the weight 12, and we can name it carbon. It is colored black because we associate that color with its common and familiar form, coal. It is like the rest, representative of the atom of carbon, but on account of some of its peculiarities, there is not the certainty which goes with the other two; but it will fill the bill, as you shall find, until men know better. Here are now three kinds of card checkers, with their weights and values, and with them we may play solitaire of an instructive kind.

We are informed that petroleum is made up of hydrocarbons, mostly of a series in which the carbon increases by one and the hydrogen by two atoms in each successive molecule.

It is the series, Cn H 2n plus 2, beginning with Marsh gas C H 4. If I am not mistaken, there are nine of them, all beef to the heel as fuel; there they are represented for your inspection. An important feature of their composition is that as the number of atoms increase, so also rises the boiling. While

Explanatory Diagram of Molecular Structure

(KEECH'S METHOD)



PATENT APPLIED FOR

Marsh gas and some others of the younger members of the family are gases at ordinary temperatures, the other ones have high boiling points. It is due to this fact that they may be thus separately *collected by fractional* distillation.

In the fuel oil, the lighter ones may be said to be in solution in the heavier ones, vaporizing at their respective flashing points, but not explosive. Let us draw the deadly double-barreled parallel. I have here produced the formulae of a true and powerful explosive, nitro-glycerine. See those red forms representing oxygen? Those little, fiery-red devils are the villains mentioned before. See how numerous they are! See the atoms of the molecule, built up to a high potential chemically, ready to form new and more stable compounds by falling to a lower potential. Why don't they fall? Because those three little peace-makers, atoms of nitrogen, and five-bonded, are holding them in their manifold grasp. They are sleeping, and so they would sleep on if this condition obtained.

Let the sharp jar of a fulminate or other atomic disturbance but shake adrift one single bond, and at once a mighty, far-reaching thrill pervades the mass from molecule to molecule. There is more than enough oxygen to satisfy the bonds in the new formations, and the peace-makers are rudely thrust aside as the oxygen atoms, aroused to their fullest activity, rush for the carbon and hydrogen atoms to form carbon dioxide and water. There is no energy *per se* in carbon, or in hydrogen, or in oxygen, but the product of their union makes apparent a certain fixed amount of energy for each atomic combination, and its liberation in an incredibly short time is the force acting along lines in every direction, which, when controlled, gives man power to rend as he makes it do useful work, but when uncontrolled, instantly hurls him into eternity. This is a true explosive, and it is the red-figured atoms which make it such.

I defy you to find them among our family of peaceful and well-behaved hydrocarbons. But—let us remember that all these operations of ours are conducted at the bottom of a sea of air, one-fifth of which consists of oxygen gas, whose constitution is represented by two atoms of oxygen, as shown. Remember that there is a subtle property of gases which causes their molecules to sneak and creep like thieves, one kind among those of another. Then, because the container is not made fool-proof and vapors may arise, you can see in your mind's eye first one and then another of our little villains creeping in and among the innocent blacks and blues, and then only, when reds are sufficiently numerous, does the mixture become explosive. The nitrogen is there also, but it is absolutely inert, and acts as a dilutant; otherwise the explosion would be still more energetic. Still it does not explode, and, like the molecule of nitro-glycerine, it would continue indefinitely. Here are the molecules of oxygen gas with those of the combustible, all moving among each other, till the molecular motion, due to the temperature of some small, near-approaching flame, shakes adrift a single bond as before; then the buttresses of stability fail, down comes the mighty arch of high potential, instantly to form new and more stable compounds, as heretofore mentioned—carbon dioxide and water. These products are gaseous at the high temperature of formation, producing enormous increase of volume, attended with high pressure, and when the shortness of time is considered, are doing work that is making changes at such a rate as to be appalling when uncontrolled. What shall be done to guard against this condition and its results? There is but one remedy—prevent the red from mixing with the black and blue. Liquid fuel is an ideal fuel—perfectly safe under certain conditions—and when these conditions are maintained it cannot explode. It is just and due to the fuel as servant, as well as to living beings as its masters, that every known safeguard should be employed to avoid setting this fearful trap, or springing it when set; there cannot be too many precautions for the reputation of the oil, provided, always, that they are in reality precautions. There is but one way, in my estimation, that will insure safety, and that is, not to permit the lighter hydrocarbons to vaporize till the burner is reached, for the burner alone is capable of taking down the ponderous arch of force, stone by stone, and hurling it where man directs. Any method of displacement that will always entirely fill the system with a liquid from induction valve to feed I am sure can be relied upon to prevent disaster and help maintain the good character I have endeavored to give to fuel oil. Don't try to make the system so much fool-proof as vapor-proof, prevent leaks, prevent spaces where vapors can form and I warrant you there can be no explosicn of fuel oil, no matter how volatile its constituents are.

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FUEL OIL.

By C. C. Perkins.

The term "fuel oil" might be applied to any of the many different oils, but generally the fuel oil when mentioned as a steam generating agent is an unrefined product of the earth known as "crude petroleum."

As an introduction, it might be interesting to take up a brief history of its early uses and discoveries. The existence of crude petroleum has been known since time immemorial. The earliest records show its use in the Province of Baku, on the Caspian Sea, in Southern Russia, where it oozed through rocks with water springs and was skimmed off the surface of the creeks. It was known by the people in that day as "rock oil," and was used by them in a very crude way for illuminating purposes.

After the commercial value of petroleum was discovered, this territory was developed, and today is one of the large oil producing districts of the world. The Russian oil, however, is inferior in quality as compared with the product of the United States, containing, as it does, a larger percentage of solid carbon.

Records do not show the discovery of petroleum in America, as it was known to the Indians before the landing of Columbus. Owing to the dense black smoke given off by oil when burning under natural conditions, the Indians found it useful in signaling to neighboring tribes from the tops of mountains.

The first oil well was drilled in 1859 by Colonel E. L. Drake. This well was located in the northwestern part of Pennsylvania, in what is now known as Oil Creek, and worked to a depth of 600 feet.

Twenty years is about the age of the development of crude petroleum in California, but it is only in the last six or eight years that it has assumed its great importance. The following extract from the Annual Report for 1902 of the California State Board of Trade will give an idea of its present and future position.

Industrial conditions show in material production a happy increase in practically all directions, especially in the oil business, its power plants, and the bearing it has on all the industries of the Pacific Coast. There are at present 2,500 oil producing wells in 14 different districts, with a production of 12,000,000 barrels. The estimate for the year 1903 amounts to 20,000,000 barrels; and by 1905 it is expected that there will be a production and consumption of 50,000,000 barrels. There are only three oil refineries of any importance in California, and the estimated amount of their consumption for refining purposes is 1,500,000 barrels, leaving 48,500,000 for fuel purposes.

When oil was first being introduced as a fuel a great many people had their doubts about the abundance of the supply. It has practically been proven that the supply is unlimited, as oil is found in every section of the State of California, but the consumption as yet has only warranted the development of those districts most conveniently located for the transportation of the product.

It is astonishing to note the large percentage of manufactories in California that are using oil fuel for the generation of steam. The last six months has the record of two conversions from coal to oil per week for manufacturing plants and steamships.

Geologists are not agreed as to whether petroleum originates from the decomposition of animal or vegetable matter, or whether from the decomposition of the two matters combined. The theory is that petroleum is contained in subterranean pockets of different areas and at different depths. Wells are drilled through the different strata of earth, gravel, sand-rock, clay, and shale, or whatever the formation may be, to the pockets, the size of which determine the life of the well.

A well-drilling outfit is principally composed of a derrick, boiler, engine, pump, an assortment of drills and about 2,000 feet of $8\frac{1}{4}$-inch casing. The rig costs in the neighborhood of $10,000.

Serious difficulties are a common thing in oil well drilling. The usual mishaps are the caving in of the casing, the losing of tools, or drilling through a long strata of hard rock. In cases where rock is struck near the surface, it is often advisable to pull up the casing and move to a new location. When tools are lost it is sometimes less expensive to start a new hole than to try to recover the lost tool.

The depths of wells range from 600 to 2,500 feet, and cost as high as $25,000 each. It is rather discouraging, after putting down a well to a depth of 2,000 feet, to find that you have a dry hole. It is sometimes the case when a pocket has been drained of all its oil, by drilling deeper a new flow may be struck. Very often wells cease flowing for a time, and suddenly begin to produce from 50 to 100 barrels per day. Some wells flow as high as 2,000 barrels per day, continuing for a period of from two weeks to two months, when gradually the amount decreases until pumping has to be resorted to, which continues at an average rate of from 50 to 100 barrels per day for an indefinite period.

In some localities where the wells are close together one engine and boiler will work the pumps of six or eight wells. In the city of Los Angeles the wells are probably located closer together than in any other district, the distance between some of them being not more than twenty feet. A curious condition is that around Summerland, in California, where wells are drilled in the ocean, some of them being 1,000 feet from the beach. The quality of petroleum varies generally as to the locality, ranging from a 36 gravity in the Coalinga district, to a 10 gravity in the Los Angeles and Summerland districts. Whether petroleum is pumped or flows naturally from the wells, there is always a quantity of salt water and sand with it.

The oil from the well is conducted to a settling receiver where most of the sand and water is separated. It is pumped from there to a large storage reservoir, and allowed to stand quietly, where the remaining sand and water is precipitated; by means of a swing pipe, the oil is then drawn from above the precipitate, and is ready for the market.

In California all the tank cars are supplied with steam coils, in order to heat the heavier oils in cold weather so that pumping is possible. The density of oils, being lighter than water, is determined in degrees by the Minus Baume Scale, having a constant relative value to specific gravity.

For fuel oil purposes, petroleum between the gravities of 16 degrees and 24 degrees is preferred, as is shown by the following comparisons of the calorific heat values:

Oils from 10 degrees to 15 degrees gravity = from 7,532 to 9,238½ calories, equalling 13,557.6 to 16,629.3 B. T. U.

Oils from 16 gravity to 24 gravity range from 10,034 to 11,264 calories, equalling 18,061 to 20,275.2 B. T. U.

COMPARISON OF OIL TO COAL FOR FUEL PURPOSES.

It is safe to consider four barrels of oil as equal to 2,240 pounds of coal. In a series of 17 tests, the average water evaporated from and at 212 degrees Fahrenheit per pound of coal was 9.215 pounds. Employing oil under the same conditions in 14 tests, showed an evaporation from and at 212 degrees Fahrenheit of 14.333 pounds of water per pound of oil, equalling over 5 pounds in favor of the oil.

In the above tests, the ashes and refuse from the coal amounted to an average of 11.537 per cent., while the refuse from the oil amounted to nothing.

An analysis of stack gases shows an average of 6.5 per cent carbon dioxide, 12 per cent oxygen, no carbon monoxide, and 81.5 per cent nitrogen. These, however, are of smaller importance, and vary according to conditions of draft and atomizing agent.

The saving of space and weight of oil over its equivalent in coal is from 40 to 45 per cent in each case.

The saving in labor when firing with oil as compared with coal runs as high as 75 per cent, according to the size and equipment of the plant, as, for instance, in a well equipped manufacturing plant in California, there are 34 boilers necessary for the generation of steam. Thirty of these boilers are constantly in operation, requiring, when coal was used, the employment of two men per boiler for 24 hours,, making 60 men. When the plant was converted from coal to one using oil, the 60 men were replaced by two capable men, with a slight increase in individual wages.

Coal firing requires the employment of a large force of men, with plenty of muscle, while the use of oil requires few men whose less developed muscles must be subservient to an ordinary amount of gray matter.

The general opinion among many is that oil is very disastrous to boilers. This is also true of coal when not properly installed.

There are many more conditions to be considered in the installation of an oil burning plant than one of coal, and the difficulties have to be experimented with. When the proper installation is attained, the results are all that can possibly be expected, as in the case where boilers have been run for six years without a spot of any kind, and where the same tubes are in today that were in originally. Clean boilers, necessitating clean feed water, and a properly constructed furnace, are the essential points of consideration.

There are at present 3,000 different patent burners on the market, ranging in price from $3.50 to $75 each. They differ slightly in parts, but in general are built on the same plan, and as far as efficiency is concerned are about equal. Some are probably a little better adapted for light oils, others for heavy oils, and others for all grades of oils. The principal points to be considered in a burner are its freeness from the possibility of clogging, its ability to be cut low or to be forced, and its simplicity of composed parts. The efficiency of an oil burning system generally lies in the construction of the furnace. A well equipped oil burning plant for stationary boilers consists principally of an iron storage tank, the required capacity of which is determined by existing conditions. This tank should be situated at a safe distance from the furnaces and from any wooden structure. If the elevation of the land will permit, it will be economical to situate this tank at an elevation of 20 feet above the burners. This storage tank should be fitted with a two-inch drawoff at the bottom, and with effective ventilators, and should connect by a pipe line with a small supply tank able to contain 24 hours supply. There should be two valves in the line connecting the two tanks, one at the storage tank and one at the supply tank. The supply tank should be elevated from 12 to 15 feet above the furnaces, giving the oil sufficient gravity to supply the burners. A pipe line of sufficient size is run from the bottom of this tank to the furnace room, an oil header running along the floor against the front of the boilers. A valve should be located in this line at the supply tank, and another just in front of the first burner. The header should be tapped at each furnace and a small pipe run to the place of the burner. This small pipe should be fitted about half way with a service cock, and at the burner end with the female part of a ground joint union. A steam line should be tapped near the main steam header and run as direct as possible to the position of the burner. It should be fitted at the end with the female portion of a ground joint union and above this with a service cock. There should be some means of blowing out this line whenever necessary. The burner should be supplied with steam regulating and oil regulating valves. It should be fitted with two short nipples with the male portion of a union at the end of each, which can be connected readily to the couplings on the steam and oil feed lines. The connections on all the burners should be the same size and the same length so that they may be easily disconnected if not working properly and may be substituted by others without any refitting. The brick construction of the furnace and the location and size of the draft depend upon the style of the burner used. Where gravity is possible, it is much more satisfactory and much cheaper to use this system than to supply the burners by a pump. All lines, pipe connections and fittings should be thoroughly tested before oil is put in. The greatest care should be taken in guarding against leaks of any kind.

The cost of changing from coal to oil lies principally in the tanks and burner. After the tanks and all piping have been installed, it requires but a short time to complete an oil burning system.

Safety.—Petroleum is not an explosive, as is the general opinion, and cannot be made so without employing mechanical means. A mixture of gases manufactured from oil with the proper proportion of air will explode when brought into contact with a flame or spark, and by that means only. Coal gives off gases which ignite under the same conditions as those of oil, and in addition an accident often arises in coal from spontaneous combustion. Such a thing is impossible with oil. Coal gives off dangerous gases at almost any temperature, which oil gives off no gases below that point of temperature indicated by the flash point of that oil. Oil with a flash test of 100 degrees Fahrenheit means that at no temperature below 100 degrees will the oil give off a gas. The fire test of an oil has the same relative meaning as the flash test. Oil with a fire test of 130 degrees Fahrenheit cannot possibly be made to burn at a temperature lower than 130 degrees, no matter what means are resorted to.

With proper handling, there is no more danger from oil than from any other inflammable matter. The only laws that will insure against the possibility of accident from the use of oil as fuel are laws that will govern the proper storage and handling of the fuel.

In summing up the comparison of the two fuels, the following facts are apparent: It takes a less amount, costing less, occupying less storage space, weighing less, with less danger if properly handled, no dirt, no smoke, and less labor to evaporate one pound of water with oil fuel than it does with coal.

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NEW SUGAR MAKING PROCESS.

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Combination of Murphy Electrode and Womack Hot-Blast Tanks.

The New Oleans "Times-Democrat" says:—

The elimination of sulphur machines, clarifiers, hot room and magma tanks from the sugar house, and the production of refined and first sugar without the use of chemicals or the present expensive machinery is the consummation which a local company expects to achieve by a combination of J. M. Murphy's electrode and T. A. Womack's hot-blast tank. Tests here and at Baton Rouge have demonstrated that electrolysis will produce 100 per cent pure cold cane juice without injury to the juice, and Womack's hot-blast tank has, on Mr. Womack's plantation, reduced all the sacharine substance in the crop to first sugar.

A company, organized here to manufacture Murphy electrodes for water purification, is negotiating with Mr. Womack to merge interests, and H. C. Warmoth is among those who believe the combination will enable every sugar house to reduce entire crops to refined firsts in less time than it now taks to produce seconds.

Mr. Murphy, Mr. Womack, Mr. Warmoth and Duncan Brown will, in the course of the next week, make practical working tests of the electrode and hot-blast tank combination at Magnolia Plantation, and on April 11 will sail for Cuba to make a crop test on one of the big plantations in the vicinity of Havana.

Purification of fluids by electrolysis is several generations old, but heretofore the materials used for the poles have been iron, zinc, copper and carbon, all of which deposited chemical compounds in the fluid purified, due to the action of the liberated oxygen upon the metal of the poles, Mr. Murphy used aluminum for the poles, and after extensive experimentation, conducted jointly with the city chemist of Pittsburg, found that 95 parts aluminum and 5 parts magnesium produced a combination of a thoroughly durable character, and one which gave off practically no deposit into the purified liquid.

The effect of electrolysis is to take out of suspension all foreign matter in a fluid and cause it to coagulate, so that the foreign matter and the fluid will not again mix.

The tests made here by Mr. Murphy with Mississippi river water and the filthiest mixtures he could produce by mixing street sweepings, inks, etc., with river water, resulted in the determination of local capital to join with him in the formation of a $1,000,000 company, especially when he demonstrated to their satisfaction that cane juice could be as readily purified of all foreign or coloring matter. These tests were conducted by W. K. Kirchoff, chemist of the Sugar Exchange in New Orleans, and last Sunday and Monday at Baton Rouge by Mr. Murphy and by Dr. Coates, the chemist of the State University. The experiments in Baton Rouge were made with juice crushed from seed cane, and in New Orleans with juice caused by mixing syrup made from first and second sugars. In all cases the result was a clear liquid, almost limpid; and the raw cane juice refined by the electrode kept for five days without souring. Cold cane juice in its normal state will keep but a few hours.

THE MURPHY ELECTRODE.

The electrode that will be used at Magnolia and in Cuba is being built by Newman & Spranley, and the finishing touches were being put to it yesteradv. It will have a capacity of about 100,000 gallons per diem of twenty-four hours. The poles consist of forty-four plates, measuring 14 by 18 inches. They are one-sixteenth of an inch thick and set one-sixteenth of an inch apart. Alternate plates are connected, forming the anodes and kathodes, or positive and negative poles, so that the forty-four plates constitute as many separate electrodes, the electrolysis occurring as the liquir passes under pressure through the narrow spaces between the plates. The plates are mounted and set in a box of slate slabs, which are set in paraffine in an oak box made of slabs one and one-quarter-inch thick. Contact points project from the top of the box proper. A space of one and one-half-inch between the bottom of the plates and the bottom of the slate box is left for the reception of the cane juice. All the juice is forced up between the plates, resulting in the electrolytic action, which coagulates the impurities in suspension and clarifies, or refines, the syrup. The syrup then passes through a pitcher-faced exit into the filter bags, which catch the coagulated foreign matter and allow the refined juice to collect. The current necessary to operate this electrode is 720 Watts, or

12 volts and 60 amperes. The box requires cleaning but once a day by the play of a stream of water, so that two of these boxes working alternate days will refine 100,000 gallons of raw cold cane juice per diem of twenty-four hours. The design for a 1,000,000-gallon per diem electrode for cane juice provides for thirty-two plates 12 by 18 inches, 1-8-inch thick and separated 1-8-inch. The plates are made of ninety-five parts aluminum and five parts magnesium, and Mr. Murphy claims that this combination is insoluble and will not go into either the water or the cane juice.

WOMACK'S HOT-BLAST TANK.

Womack's hot blast tank, on which Mr. Womack has patents, is the product of many years of thought and labor by the patentee, and was used by him on the last crop of cane he took off, resulting in clarified all first sugar in excess of normal aggregate weight of first, second and third, with only glucose refuse. The hot blast tank consists of a wooden tank into which the molasses from the first sugar is jetted down through holes in the bottom of an inlet pipe extending over the tank. In the bottom of the tank is a coil of pipe containing thousands of very small holes, through which dry steam jets upward, striking the molasses as it falls into the tank. It results in an instantaneous thinning by heat of the thick molasses and its decoloration almost to the color of normal raw juice. Flowing from the hot blast tank, the syrup is mixed with a flow of clear raw juice from the presses or filters, and this mixture is sent through the original process. Thus the sugar produced is always first sugar, until the molasses fluid discharged into the hot blast tank is free of saccharine matter, when the supply is cut off and the glucose refuse cleaned out.

The hot blast tank does not, of course, produce refined first sugar from unrefined juices, and the glucose refuse is unrefined, and, therefore, unmarketable. Mr. Womack believes that the refining of the raw juice by the Murphy process will result, in conjunction with the hot blast tank, in the production of refined first sugar, leaving an almost thoroughly refined, and, therefore, marketable glucose. In this event the combination would result in:

ASSUMED RESULTS.

1. Reduction of all saccharine to refined first sugar.
2. Marketable glucose as a residue, instead of unmarketable material.
3. Less machinery than is now used to produce unrefined first, second and third sugars with a useless residue.

4. Continuous process, instead of a lapse for granulation of twelve days between first and second sugars and of from sixty to one hundred and twenty days between second and third sugars.

Sugar-making Process Under the Present Method, With Improved Machinery—Juice after leaving the mill is sulphured, then limed in the clarifiers, after which the impurities are brushed from the surface and the juice run into tanks. The bottom, or solid, is sent through filter presses and the clear juice from the presses mixed with clear juice from the clarifiers. The mixtures is light amber in color. It is sent to the second or third effects and boiled to a density of 25 Beauma. Then it is sent to the vacuum pan and then to the mixer, then to the contrifugals, when the dry first sugar is separated from the molasses. The molasses is reboiled in the vacuum pan, filled into the cars and put in the hotroom in magma tanks and left usually about twelve days to granulate, then run through the same process as before, beginning with the centrifugals, where the dry second sugar is separated and the molasses again boiled and sent to the hotroom or magma tanks for from two to four months for granulation for the third sugars.

Assumed Course Under Combined Murphy Electrolysis and Womack Hot Blast Tank Process—Juice from the mill is forced through the electrode and clarified and refined, passing to the filter bag or filter press, thence direct to double or triple effects, then boiled to 25 Beauma, then to vacuum pan, then to centrifugals, whence the molasses passes to the Womack tank and by continuous passage back to mill tank, etc., until boiled four or five times. Hence practically no hotroom is required, as only the molasses from the fifth strike would require to be boiled into "string sugar," as the molasses from the first strike is called under the present process.

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MEMORANDUM ON THE SUGAR PRODUCTION OF THE WORLD.

By Sir N. Lubbock.

The total production for the last two years may be taken as follows:—

	Tons. 1901-2.	Tons. 1902-3.
European beet, except Russia........	5,722,000	4,390,000
Russia.	1,099,000	1,215,000

British Colonies.	545,500	513,000
Egypt..	96,000	90,000
India.	3,000,000	3,000,000
United States, Cuba, Porto Rico, Manila and Hawaii..................	1,804,500	1,920,000
Peru, Argentine, St. Domingo, Mexico, and Brazil.	738,500	582,500
Java.	767,000	842,500
French Colonies.	110,000	104,000
	13,882,500	12,657,000

Of this:—

The Indian production is required for Indian consumption..	3,000,000	3,000,000
Russian production is required for Russia and Asia......................	1,099,000	1,215,000
United States, Cuba, Porto Rico, Manila and Hawaii, for United States..	1,804,500	1,920,000
Beet for European consumption, exclusive of United Kingdom.........	2,656,000	2,750,000
	8,559,500	8,885,000

There remains available for United Kingdom and other countries:—

Beet in Europe.....................	3,066,000	1,640,000
British Colonies.	545,500	513,000
Egypt.	96,000	90,000
Peru, Argentine, St. Domingo, Mexico, and Brazil.	738,500	582,500
Java.	767,000	842,500
French Colonies.	110,000	104,000
	5,323,000	3,772,000

Dissecting these items:—

Beet in Europe available for export from Austria and Germany........	2,115,000	1,590,000

British Colonies:—

The Mauritius crop goes to India....	147,000	140,000
Queensland and Fiji to Australia.....	151,000	110,000
West India to United States.........	200,000	210,000
West India to United Kingdom......	47,000	53,000
	545,000	513,000

The remaining cane production is available for United Kingdom consumption.

Thus we have of beet and cane sugar available for supply of United Kingdom:—

Beet:

Germany and Austria	2,115,000	1,590,000
Other	951,000	50,000
	3,066,000	1,640,000

Cane:

British West Indies	247,000	263,000
Argentine, Peru, Brazil, St. Domingo, and Mexico	738,500	582,500
Egypt	96,000	90,000
Java	767,000	842,500
French Colonies	110,000	104,000
	1,958,500	1,882,000

If bounties were allowed to continue, the whole of this cane supply would be jeopardised, and it is evident that we should have practically to depend entirely on Germany and Austria.

On the other hand, the abolition of bounties keeps the door open to this large quantity of sugar.

These figures prove incontestably that the interest of the consumers of this country would have been most seriously compromised but for the Brussels Convention.—International Sug. Journal.

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CONSUMPTION OF SUGAR PER HEAD IN EUROPE AND NORTH AMERICA.

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For the Years 1900-1901 and 1901-1902.

	1901-1902.		1900-1901.	
	Kg.	lbs.	Kg.	lbs.
Great Britain	44.47	97.83	44.52	97.94
Switzerland	27.75	61.05	24.29	53.44
Denmark	24.52	53.94	23.40	51.48
Holland	21.21	46.66	20.12	44.26
Sweden and Norway	20.84	46.00	17.89	39.36
France	15.81	34.78	16.64	36.60
Germany	13.82	30.40	13.88	30.53

Belgium.	11.44	25.17	10.73	23.60
Austria-Hungary.	8.37	18.41	8.11	17.84
Russia.	7.76	17.07	6.53	14.36
Portugal and Madeira.	6.41	14.10	6.42	14.12
Spain.	4.48	9.85	4.55	10.01
Greece.	3.67	8.07	3.41	7.50
Turkey..	3.66	8.05	3.66	8.05
Italy.	3.27	7.19	2.80	6.16
Servia.	3.13	6.88	3.12	6.86
Roumania.	2.85	6.27	3.46	7.61
Bulgaria.	2.80	6.16	2.67	5.87
All Europe.	12.88	28.33	12.57	27.65
North America.	32.02	70.44	30.29	66.64
Mean..	15.86	34.89	15.28	33.61

—International Sug. Journal.

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THE SUGAR INDUSTRY IN QUEENSLAND.

BY J. T. CRITCHELL.

THE COMMONWEALTH AND THE KANAKA.

The present moment is opportune for writing an account of the Queensland sugar industry, as it is now possible to form a rough idea of how growers are getting on without the assistance of Pacific Islanders for field work. The Kanaka bill issued in October, 1901, by Sir E. Barton, Premier of the Commonwealth of Australia, took everybody outside politics by surprise, as it was taken for granted that full inquiries would be made before legislation was passed. The large amount of capital invested in sugar growing and making in Queensland (estimated at £7,000,000 to £10,000,000), and the important place the industry occupies in the agricultural and commercial fabric of the State, called for caution and deliberation, but the Federal government, acting at the instigation of the labor party in Parliament, carried the Kanaka bill, notwithstanding the strenuous opposition of the Premier of Queensland, the Hon. Robert Philip, who voiced public opinion in Queensland apart from the labor vote. It is, however, necessary to add that at the Federal elections in March, 1901, Queensland sent down a largely predominating labor representation, pledged *inter alia* to a "White Australia," including, of course, Kanaka abolition.

Under the measure South Sea Islanders have to be limited in numbers imported up to 31st December 1903, in March 1904 importation is to cease altogether, and any Islanders in the State on 31st December, 1906, must be deported. Five years were thus given to planters to provide substitutes, or give up business, an uncommonly awkward fix for them. In some quarters it is held that this exclusive policy may be modified before the time comes for the removal of the Kanakas, but I don't think there is any good ground for entertaining such hopes, the color question being a part of the bed-rock policy of the powerful labour party in Australia. Rightly or wrongly, the dominant class there has made up its mind to keep out all black and yellow races; they say: "We won't run the risk of having racial troubles such as we see in the United States," but, as at the same time they have set their foot down (as firmly as they dare), upon the immigration of whites too, this argument lacks force.

Therefore, the Queensland sugar growers have made up their minds that the Kanaka has to go. There are rather less than 10,000 of these Islanders in the State; half of them are depositors in the Government Savings Bank, £32,000 lying to their credit. Many are married, and their children born in the State, being British subjects, cannot be deported by force in 1906, so the Federal Act will, in some cases, separate parents from children.

Polynesians were first brought to Queensland in 1866, and the recruiting and employment came under State control two years later. The working classes were always bitterly opposed to them, though the Kanakas have only laboured in the field, leaving mill work to whites. In 1884 a Royal Commission was appointed to report on the Kanaka question, and, as the result, the then Premier, Sir Samuel Griffith, initiated legislation excluding Kanaka immigration after 1890. The sugar industry immediately showed signs of decline, no capital could be got for it, and the people of the colony raised such an agitation that Sir Samuel Griffith had to recant. The trade was again legalised, and was conducted quite satisfactorily till the Commonwealth bombshell fell in Queensland in 1901. It may be suggested that what occurred after 1884 may again take place, but there is a great difference; then the voters of Queensland had to decide, now the decision rests with a Parliament drawn from mainly, as to numbers, the large population of Sydney and Melbourne, which, living in temperate climes, 1,000 and 1,500 miles away from the Queensland sugar growing districts, have no knowledge of tropical conditions.

The vessels enlisting Kanakas are licensed by the Government, and a "Government Agent" is on board of each schooner to see that the Islander gets his full rights. The latter is indentured to a planter for three years, and is provided with house-room, food, and clothes, and £7 to £8 a year wages; they are a happy and contented people on the plantations, and a large number decline to take advantage of a return passage at the end of their three years, which the Government offers them. These become "walk about" Kanakas, and re-engage on their own account. The total annual cost of the Kanaka is from £30 to £40.

I have dealt fully with these South Sea Islanders, as the fine Queensland sugar industry has been built up upon their work in the fields. In arguing that the white man is physically able to labour in the open air, tending the sugar plant in North Queensland in summer time, and able to continue to do so from year to year, as the Kanaka does, the Australian politicians are advancing a contention which is opposed to the logic of fact, as your readers interested in sugar cultivation in other tropical parts of the world know full well. What might with advantage have been done was to establish a "color line" at the tropic of Capricorn. As things stand, no Asiatic or Pacific alien is permitted to land in Australia; and the productive territories of Northern Australia, which cannot be developed without coloured labour, must therefore lie fallow! I discussed the burning question of the future of Queensland's sugar industry, under the new conditions, during a recent tour in that State, with many people. Mr. A. C. Cowley, M.L.A., one of the best authorities on Australian tropical agriculture, said:—"As a big thing I fear the industry will become extinct, and I think it is possible that the Colonial Sugar Refining Company will take all its plant to Fiji. No doubt, on a small scale cane sugar will continue to be grown in Queensland by whites."

THE NEW SUGAR REGULATIONS.

The duty imposed by the Commonwealth Tariff on cane sugar is £6 a ton, on beet sugar £10. There is an excise of 3s 0d per cwt., and in order to give a fillip to the employment of white labour in the sugar fields, the Government have issued a set of regulations under which growers can claim rebate for "white-grown cane," that is, cane planted, cultivated, and harvested, by white labour. As the new conditions have so recently been in force, no supervision was exercised over the planting of last season's crop, the regulations were only applied to the sugar fields at March 1st, 1902. The rebate is intended to be £2 per ton of sugar, and the allowance is fixed according to the district and its special average sugar-giving contents of cane, viz.:—Southern district, 10 per cent., 4s 0d; Central district, 10.83 per cent., 4s 4d; Northern district, 12.5 per cent., 5s 0d. The weight of the cane is checked at the mill on delivery, and a rebate note is issued, which on being confirmed by the Customs Officer in the district, is cashed within three days. It was necessary that sugar-growers should register by February 28th, last year, as to whether they intended to employ white labour and claim the bonus under the Regulations. This has been done by planters all over the sugar lands of Queensland, as to part of their estates, so the experiment has been tried, and we on this side are anxiously waiting full particulars. Crushing in Queensland begins in July, and harvesting operations are carried on from July to November, comparatively cool months. This year's experience will be a better guide as to the future than that of the season just over, inasmuch as all rebate sugar will have to be both grown and harvested by white labour.

The Sugar Journal, published at Mackay, Queensland, states in its latest issues to hand, that about one-third of the cane grown in its district last year was cut by white men, and the same journal says that it is not likely that the proportion in 1903 will work out more favourably for the theory of those who say that white men can do black men's work. But taking the sugar producing areas of the State as a whole, nothing like one-third of the cane of 1902 was cut by whites; one-seventh may be nearer the mark as an estimate. Taking growers in Queensland as 2,500, we find that about one-third (855) claimed rebate, though such claim did not enforce employment of white men. Judging by the rather incomplete particulars available, white men on contract work—they generally work in gangs—cut about two tons per day per man, at 3s 0d per ton.

But after all, the main contention of planters is that the difficulty to be feared is not so much that white men cannot do this work, as that it will be impossible to get sufficient numbers of them; if they are going to fully replace Kanakas they will have to come forward to the number of 8,000 to 10,000, and nothing like such figures have been chronicled in 1902. For many years white labour has been employed in a desultory way on the Queensland sugar estates at harvest time, and the objection to it on the part of the owners has been both on account of unreliability and want effectiveness. In the most southern of the districts, Bundaberg, about latitude 25, there is a greater volume of white labourers available, the out-come of proximity to the capital, Brisbane, and the coolness of the climate. In the North, Chinese, Hindoos, and Malays supplement the Islanders, though these aliens will rapidly fail, as their numbers cannot be recruited under the exclusion policy of the Federal Government.

It is likely enough that the bonus referred to above will be demanded by the contract cutters, and mill hands, in increased wages.

CENTRAL MILLS.

The sugar planter of former days, who grew his cane and crushed it himself, owning both estates and mills, was pretty well ruined by the state of things induced by Sir Samuel Griffith's Act aforesaid, and by the low market prices for sugar following the development of the bounty-fed article; he could not stand against attack from both within and without, and planters were mostly overwhelmed by these tendencies. The Government which had decreed the abolition of reliable labour saw with dismay the impending extinction of the industry, and realized that it had to come to its assistance in some form or other. So the system of central factories was established, and mills were erected by State-found money; the Sugar Works Guarantee Act of 1893 was passed, under which the Government advanced funds to companies of farmers to erect mills and machinery. The process was for the company to issue debentures which were guaranteed by the Government, which itself cashed them at 5 per cent interest, holding these securities for placing on the market, if desirable. Repayment had to be made in 15 years. Thirteen companies have been registered under this Act, and the figures to 30th June, 1902, may be tabulated:—

	£.
Total advances to 13 central mills......	514,600
Interest and redemption paid..........	90,855
Do. do. unpaid..........	70,090

Only three of these establishments have a clean sheet as regards payment of interest and redemption; so it will be seen that the central mill in Queensland has not proved financially successful, though it has fostered the industry. Two mills, North Eton and Racecourse, at Mackay, were formed by direct Government grant, before the Act referred to was passed, in order to test the problem of growing cane with white labour.

For the season 1901-2 the following returns were issued, comprising the operations of the 13 mills in question:—Cane crushed, 301,881 tons; average cost of cane, 14s. 6 3-4d.; sugar manufactured reduced to 88 per cent N.T., 33,112 tons; average cane to sugar, 9.12 tons; average cost manufacture at mill, plus cane purchase, plus f.o.b. expenses (Mossman and Mulgrave Mills), per ton cane, £1 0s. 6d., per ton sugar, £8 19s. 6d.

The number of growers contributing to these 13 mills were 816. The balance sheet shows that all the mills—save one—show a profit as the result of work, varying from £3 3s. 2d. per ton of sugar (Isis Mill) to 1s. 7d. (Prosperpine Mill),

The central mill system is now all but entirely accepted; the land is mortgaged to mills, and the mills to the Government. Farmers cut in July to deliver about 10 tons of cane per day to December.

Apart from these central mills under State subsidy, the system of separating the growing of sugar from the milling, and the establishment of privately owned central mills, has now been in existence for some time, and is the prevailing method under which the bulk of sugar is now produced in Queensland. Many of the large plantations have been cut up and sold in lots to small farmers, who covenant to supply cane at a price fixed according to density. The great corporation which virtually manages the sugar trade in Australia, the Colonial Sugar Refining Company, generally termed, in short, the C.S.R. Co., leases much of its sugar lands to growers who supply the mills with cane. The passing of sugar planting into the hands of peasant proprietors, a system which gradually came about under the central mills, was hailed as a great boon, and in a democratic community like Queensland the change undoubtedly was beneficial. Still, it must be remembered that the plan upon which the mills were founded was that cane for them should be grown entirely by whites, a theory which could not bear the brunt of practice; in every direction it was departed from. Miss Shaw, the special correspondent of the *Times*, who went to Queensland in 1892, sent home some letters to her paper describing the passing of sugar planting from the old order to the new. She was very enthusiastic over the change, and spoke of "small growers and large mill-owners as the basis of future success." The correspondent unearthed a selector on the Herbert River who had cleared 100 acres and had 70 under cane; he was making a net profit of £300 a year—the difference between income £800 and working expenses £500—the average price for cane at that time was 10s. a ton, standing in the field, and price for cutting and delivering 2s. 6d. A year or two later there were about 1,400 sugar holdings in the colony, comprising 70,000 acres, ranging from 2 to 110 acres—I refer to the small holdings under the Government central mill system. At the time Miss Shaw wrote there were from 400 to 500 farmers engaged in growing cane.

This method of working the industry on a democratic basis was a development of enormous importance, and had the movement been coupled with the realization of the contention of the working class leaders that white labour was competent for all the field work, the business of making sugar in Queensland would not be in such a parlous state as it is now.

THE MILL MANAGER AS HARVESTER.

But another method of arranging the handling of cane seems imminent, according to the information I received during my visit to the State. Miss Shaw saw democracy supplanting planters. Since her visit the output of sugar has been doubled, though no more coloured labour has been employed than in the days of the planters, a creditable result for central mills and their collateral system of cultivation. Now, however, instead of there being about 500 farmers, there are over 2,500, and keen competition has consequently been introduced, with the consequent necessity of working the cultivating department of the industry on a strictly scientific basis.

It is being found that it is difficult, if not impossible, to get farmers to attend to the all-the-year-round work of cultivation thoroughly, and therefore another change is coming over the scene. Money and brains are taking hold of the work; the methods in vogue for the last 10 years of growing and harvesting cane by farmers possessing limited organising power, brains, and capital, cannot go on, if sugar is to be produced at a profit. The growers do not cultivate their cane all the year round, as they should, and the future of the central mills in the State depends upon good cultivation and smart harvesting. The present state of the farmers growing sugar in Queensland is that they just make a living, being but the feeders of the C.S.R. Co., who will keep them going as long as they can grow cane cheaper than the company itself. The chief fault of the Queensland farmers is that they work their land to death. The idea of the old fashioned manufacturer in Queensland and big owner of estates was to rid himself of trouble in looking after masses of labour, and to stimulate white labour by making the subsidiary co-operative farmers a sort of works overseer. It is now found that when crushing comes, each farmer, bound by contract to supply a cetain quantity of cane to a mill per day, employs all his labour on his own fields in harvesting, neglecting to look after cultivation. The new system now coming about is the organization of labour for harvesting by the mill manager, who says to the farmer, "we will take off your crop at 2s. 3d. or 2s. 6d. a ton." This way of doing business is rapidly extending, and it possesses the advantage of allowing the farmer to devote himself to his farm constantly.

BOUNTY OR NO BOUNTY.

An interesting and apropos question at the present time is this:—Does the assistance rendered to the sugar industry in Queensland by the Government, under the Act described, constitute a bounty on sugar production? Questions have been asked in the House of Commons, and the Ministry does not seem to be very clear on the point. The condition, as your readers know, is that if any British Colony grants bounties on sugar cultivation or manufacture, Great Britain would have to penalise any imports of sugar that may come from that Colony. The fact that there is not the least likelihood of Queensland exporting sugar here at present does not affect the argument.

In considering the matter, I cannot do better than quote the statement made on the subject by Sir Horace Tozer, Agent-General in London for Queensland, when lecturing at the Royal Colonial Institute on January 17th, 1899.

"It is contended in some quarters that the assistance given "by the State in this industry is equivalent to a bounty. The "facts will show that this is untenable. The cost of the intro-"duction and regulation of Pacific Island labour is borne by "a special fund provided by the planters. It is true that the "State has, in accordance with its general policy of advances "to local bodies, provided the funds for the purchase and erec-"tion of twelve central out of the sixty-five mills at work in "the colony, and to the extent of half a million sterling; but "the repayment of principal and interest is secured, not only "by a mortgage over the mill, but over the freeholds of the "many co-operators who own and supply the mill with cane. "Under this credit mobiliser system, all moneys advanced are "repaid to the State as to a private mortgage."

This voices the opinion held generally by men who have thought out the point; they come to the conclusion that the relations between the State and sugar producer is that of lender and borrower—just a commercial position. The State can foreclose if it chooses, in case of unpaid interest; in fact, this has been done in one instance, where the Government put in a manager, much to the benefit of the mill owners for he made it pay.

DR. MAXWELL.

In considering the present conditions on which sugar production stands in Queensland, leaving statistics and descriptions of districts till later, I must devote a litte space to the advent in the colony of Dr. Walter Maxwell, who came from Hawaii, where he was Director and Chief Chemist of the Experiment Stations of the Hawaii Sugar Planters' Association. It was felt in Queensland that the services of a modern sugar expert, well versed in scientific knowledge and possessing experience of sugar growing in other countries, were required. Dr. Maxwell was invited by the Govenment to investigate the condition of the sugar industry, which work he undertook at the end of 1899. His report deals fully with the more technical and scientific aspects of the subject, state of soils, climates, etc., and he recommended the establishment of Experiment Stations in the sugar growing districts. Dr. Maxwell was appointed Director of Experimental Stations, under special Act of Parliament, in 1900, at a salary of £3,000 a year, his engagement being for five years. His work in the colony has been directed towards the systematising and organisation of the industry on a scientific basis; he analyses soils, recommends manures, and generally gives technical advice to growers. (Dr. Maxwell is fond of quick-acting manure which the cane plant can seize upon.) His special line has been irrigation, which is coming to be accepted in Queensland as the proper means to ensure successful sugar growing. Dr. Maxwell did good work in Honolulu, and it is expected that under his guidance cultivation in Queensland may assume a modern and scientific aspect. The Regulations given above owe their form to the advice tendered by him to the Commonwealth Government. A special levy of one penny per ton of cane (1-2d. paid by grower, 1-2 d. by mill) is made upon the growers and mill owners towards the cost of Dr. Maxwell's department. In 1901, £4,923, representing one penny per ton on 1,181,522 tons crushed, was received, and supplemented, £ for £, by the State Government, towards the Bureau of Experiment Stations' expenditure, which only amounted to £6,722.

EARLY DAYS AND PROGRESS.

The first cane produced in Queensland was grown by Captain Louis Hope, on the Logan river, about 1860, and the first sugar manufactured was a parcel of 7 pounds, made as an experiment, *coram populi*, in the Brisbane Botanic Gardens, in 1863 or 1864, by Mr. Buhot. People then said it was impossible to produce granulated sugar, owing to the climate, and Mr. Buhot, holding the contrary, rigged up a rough plant, and gave a show. After that the farmers on the little rivers south of Brisbane cultivated sugar on a small scale, and Mr. Porter constructed a floating sugar mill, called the "Walrus," which moved from farm to farm. Brisbane, however, is too far south for sugar to be grown commercially, and the start of the industry on business lines took place at Mackay, a coast town, in latitude 21 south; Mr. John Spiller, now living in England, planted the first cane in the Mackay district in 1864. The Alexandra mill was erected in 1868, and 230 tons of sugar and 148 hogsheads of rum were produced. In the seventies the industry waxed, and by 1879 quite 10,000 tons of sugar were produced by the Mackay mills.

By 1879 sugar growing had spread considerably, and cultivation was distributed amongst (roughly) three districts: Bundaberg, latitude 25 south; Mackay neighborhood; and the rainy belt, from the Herbert river, latitude 19 south, to Port Douglas, 16 south. These points are the centres of the industry.

As to the progress of the sugar growing, I may tabulate the following figures:

Year.	Mills.	Acres of cane crushed.	Sugar manufactured. Tons.	Molasses. Gallons.	Spirits. Gallons.
1871.... ..	55	3,078	3,762	219,694	112,979
1881.... ..	83	12,306	15,564	602,960	201,111
1891.... ..	68	36,821	51,219	....	192,051
1901-2.. ..	52	78,160	120,858	3,679,952	171,626

The best yield that has been chronicled was in 1898, when 163,734 tons of sugar were produced, 4,000,000 gallons of molasses, and 131,000 gallons of spirit.

A good rough division of the colony into sugar districts is as follows: South of latitude 24 (1900, acres under cane, 44,396, tons sugar produced, 23,298); between latitude 20 and 24 (1900, acres under cane, 29,032, tons sugar produced, 20,671); and north of latitude 20 (1900, acres under cane, 35,107, tons sugar produced, 48,585). Following are 1901 statistics for the whole State:

Crushed. Acres.	Average yield of sugar per acre. Tons.	Tons of cane per acre.	Cane to sugar. Tons.
78,160	1.55	15.10	9.76

VISITS TO DISTRICTS.

I spent some days last May in Mackay, and Mr. T. D. Chataway, editor of the *Sugar Journal*, kindly showed me round, and gave me much useful information. All Queensland was then suffering from a fearful drought, even the rainy belt not getting its usual quantity of precipitation. Mackay had had 22 inches in the monsoonal months, instead of the usual 40 inches, and in consequence the growing cane had suffered considerably—a crop of 18,000 tons of sugar was expected against the average of 26,000; Mackay has gone to 33,000 tons. The ratoons were very backward, owing to lack of rain at end of 1901. Mackay notes include the following: Average proportion of cane to sugar, 8 3-4 tons. The grub pest, virulent in past years, had been got under by a sort of "beetle bee;" families turned out and joined forces with the Kanakas in attack, and 12 tons of beetles were caught and boiled. One season 30 tons of beetles were destroyed. A parasitic wasp also plays havoc with this grub, in the body of which it lays its eggs. Another moth borer gives some trouble; the remedy is to cut out affected parts and burn. The worst of all borers is that which hails from New Guinea; it came some years ago with specimens of wild cane, which has all been dug out and burned. All pests are now well in hand. Bourbon cane, being liable to rust, is not used. I visited several of the mills, notably Habana, the proprietor of which, Mr. E. M. Long, is one of the most experienced and up-to-date sugar men in Queensland. Mr. Long was the first man in Queensland to adopt the system of increasing farmers' areas and decreasing estate crops. Cane, excepting ratoons, was looking well everywhere. Coffee is being grown in the district. A good deal of controversy exists as to the policy with regard to the Lantana plant, which has covered the whole neighborhood, and threatens to become a serious pest; it is a good fertilizer, and makes splendid hedges, but requires to be kept well in hand.

About 1875, during a particularly adverse season, a bad attack of rust ruined the crop, and caused the industry in Mackay to receive a decided check, and its backers thought that the climate of the colony was unsuited to growing cane. At that time the Bourbon variety was almost entirely grown in Queensland. Cultivation, no doubt, at that date was very imperfect. Mr. R. W. McCulloch, in the Queensland *Official Year Book*, states that the cane varieties, "Rappoe" and "Rose Bamboo," small quantities of which were grown in the early days, successfully resisted the disease which decimated the "Bourbon" cane. Mackay continued to be the headquarters of the industry, and fortunes were made there during the good prices which prevailed along in the seventies. As sugar growing spread, the northern lands were brought under cane; these districts, having a rainfall of from sixty to two hundred inches a year, and possessing the true tropical moist heat, seem to be the ideal home of the cane in Queensland. However, a little sugar growing takes place right down to the New South Wales border.

I was at Geraldtown, on the Johnstone river, for a few days, the region of perpetual rain. Sugar and bananas are the produce of the district. Of the latter no less than 1,320,620 bunches were exported from the port in 1901, cased and loose; taking an average, I make it that this means no less than 236,764,000 single "fingers" sent away that year. The fruit is mostly grown by Chinamen, who make a good living after paying £1 per acre per annum for uncleared scrub lands. A tramway runs from the port to Goondi plantation, and is continued farther to open up the fruit growing district. This municipal tramway system is seen in connection with several of the sugar growing neighborhoods of Queensland; the local authority raises the money by loan, and builds and manages the lines, which are very useful institutions, and which mostly pay well.

The Pioneer plantation on the delta of the Burdekin river is notable as the first and only sample of a system of cane growing by irrigation; since my visit to the colony, however, irrigation has been applied to the Bundaburg district, as indicated above. The plantation belongs to Messrs. Drysdale Brothers; Mr. Douglas Brown is the manager, and Mr. John Drysdale was in residence during my visit. About 450 hands in all are employed; 200 Kanakas, 90 Japanese, 30 Chinese, and 120 whites, and there are subsidiary cane growers. In 1901-02 there were 1,100 acres under cane, and 34,000 tons were taken off—an average of 31 tons to the acre; the highest yield was 70 tons. The estate is well developed, with a tramway running through it (a little locomotive made by the Hunslet Company called the "Pioneer" has done splendid service), a 60-ton mill, a splendid residence for the manager, hospital, good houses for the colored laborers, and 15 pumping plants. There were 3,000 tons of firewood stored at the mill when I paid my visit; this wood is collected in the off season, when the unopened bush is cleared for cane by the Japs, who work on task work partly; only raw sugar is made, which is sold to the company. Messrs. Drysdale have 47 farmers round them growing cane for their mill; the average area of the farms is 300 acres, 50 of which will perhaps be under cane, the market price of which is about 12s. These farmers are financed from the plantation, which supplies them with pumping plants and ploughs and teams; in good seasons this arrangement works well, and maize is grown on the space not occupied by cane. I noticed that on the Pioneer farms trashing was not practiced, burning (carefully supervised by the plantation authorities) takes place before cutting.

In the whole of this district water can be easily drawn by penetrating the water-bearing sand, saturated by the flow of the Burdekin river. The plantation water is drawn by powerful pumps from permanent lagoons; one draws 8,000 gallons a minute. The water is conducted by flumes to the cane fields, where it is run through the plants in channels. The farmers round, with their smaller requirements, use spear-point pipes for boring into the sandy soil, and generally strike water about 20 or 30 feet.

The climate of the Bundaberg and southern districts is not particularly well suited for cane planting, on account of the uncertainty of rain and the occurrence of dangerous frosts. Light frosts are occasionally experienced at Mackay and the Herbert River, but these are not of sufficient importance to be injurious. In the ideal sugar-growing land of the north, within the rainy belt, there are still to be obtained plenty of uncleared scrub lands well suited to cane cultivation. These lands have rich alluvial and volcanic soils, and are valued (ten miles from mills) up to £7 an acre.

Going southwards from Port Douglas—the farthest north—I give a record of the chief mills in the various sugar districts. At the Mossman river (Port Douglas) there is one central mill, the largest and one of the most successful in the State, which crushed in 1901, 56,000 tons of cane, and which put up a record in November, 1902, by producing a ton of sugar from 6.2 tons of cane. At Cairns there are two mills, the Mulgrave Central, which handled 51,000 tons of cane in 1901, and Hambledon, belonging to the C. S. R. Company. On the Johnstone river, still south, there is a large mill belonging to the company at Goondi, and one at Mourilyan, the property of the Union Bank of Australia. On the Herbert river, the southern border of the rainy belt, the company have two mills, at Victoria and at Macnade; Messrs. Wood Brothers and Boyd own the Ripple Creek mill. Going south again, we come to the Burdekin delta, where is the Pioneer estate of Messrs. Drysdale Brothers & Co., and two mills belonging to the Australian Estates Company, Seaforth and Kalamia—these two are managed by Messrs. Drysdale.

Approaching the important district of Mackay, there is the Prosperpine mill on the river of that name, a central mill establishment. At Mackay there are five central mills, Racecourse, North Eton, Marian, Pleystowe, and Plane Creek, and one mill, the property of the company, Homebush; the Palms (Australian Estates Company), Habana (Long and Robertson), Meadowlands (W. H. Hyne's Executors), Palmyra (H. Macready), and Farleigh (till lately the property of the late Sir John Lawes' Executors; this estate, mill and 7,000 acres cost from £70,000 to £80,000, and has been quite recently sold). Leaving Mackay, we next get to Bundaberg, where there is a refinery at Millaquin, owned by the Queensland National Bank, and managed by Mr. Eastick. This mill and refinery handles in all from 10,000 to 15,000 tons of sugar annually, and the refined sugar is sold in the open market. Fairymead belongs to the Messrs. A. H. and E. Young, and Bingera to Messrs. Gibson and Howes. This firm have recently spent £30,000 in irrigation plant, and have irrigated 1,000 acres of cane, which were expected to yield 35 tons last (1902) season. There are 12 other mills at Bundaberg, and six juice mills. South again to the districts called the Isis scrub; here there is the Isis central mill, which handled 30,000 tons of cane in 1901, the Childers factory, belonging to the company, and a small central mill in private hands. There are central and privately owned mills at Gin Gin, Moreton, Mount Bauple, Nerang river, etc., but those specified above are the principal, and give an idea of the distribution of the mills in Queensland.

The company takes the whole output of Queensland cane, except that produced at Millaquin refinery, and Bingera, Fairymead and Ripple Creek mills.

Out of the 108,535 acres under cane in 1901, Mackay claimed 24,000, the rainy belt 33,000, and Bundaberg and district 42,000. In that year 78,160 acres of cane were crushed, yielding 121,000 tons of sugar; there were 32,000 acres of stand-over or unproductive cane. The weight of cane was 1,180,000 tons.

CONCLUSION.

The Colonial Sugar Refining Company, referred to in this article as "the company," finances the central mills in bad seasons, and handles practically the whole cane crop in Queensland, and, under the new system, will probably become the Sugar Trust of Australia—a beneficent rule. They fix the price at which they buy from growers and makers by taking the market prices for refined sugar at the following places: Auckland (New Zealand), Adelaide, Melbourne, Sydney and Brisbane—£8, say for 88 per cent. If a rise occurs during the season at these points, the farmer gets the proportion (according to time of the rise), to the extent of 18s. in the pound. In the 1901-2 season, farmers got 39s. bonus. The proportions (of volume handled) figured out belonging to the cities named being respectively 16 per cent., 11, 33, 33 and 7.

It will be seen that at present the sugar industry in Queensland is an uncertain and complex condition. The grower of cane is protected by the Commonwealth government against over-sea competitors sending beet sugar to the extent of £10 per ton. He receives a bonus if he can get his crop cultivated by white labor from the same source, and the company buys his product at a fair market rate, and divides any rise which thereafter may take place. The company are distributing during 1902-3 a special bonus, equal to 21s. 5 1-4d. per ton of sugar, towards carrying out the Commonwealth's intention of letting growers reap advantage from the difference between fiscal and customs' duties (excise £3 and duty £6). The company are presumably retaining the large proportion of the difference to meet the fall in the price of sugar which has taken place.

We have yet to learn if exclusion of colored labor is to be quite effectual; there are lots of Chinese and coolies in the northern territory, and unless government patrols are established along the rivers of northern Australia, there will be no means of keeping the Macassar boats from landing men, who can easily work into Queensland. If effectual, it may be taken for granted that sugar growing on a large scale will be severely injured in the north of the State of Queensland; in the south white labor—if available—may do.

Experience so far shows that an import duty of £10 a ton is not sufficient to check beet import into Australia, which will this year be an importer.

The terrible drought of 1902 was expected to cause a loss to Queensland sugar growers of about £10,000; in such a season the ideal position of growers is the rainy belt. Nothing but a good system of irrigation can insure safety to planters in the dry districts.

The future of the industry in Queensland is limited only by the consumption in Australasia, which may be put at 200,000 tons. There is, therefore, any amount of room for expansion, supposing the labor question settles itself; in the future, if the industry develops, Queensland growers may make a profit of, say £2 10s. a ton on 200,000 tons consumed in the Commonwealth and New Zealand, and will then be in a position to export, say 50,000 tons surplus, on which they may be content with 10s. profit.

The January issue of the *Sugar Journal* gives the following figures to show the output of sugar in Queensland for the last three years. The figures for the season just ended are only approximate:

	Year ending June 30, 1901. Tons.	Year ending June 30, 1902. Tons.	Ap. Output for season just ended. Tons.
Brisbane.	2,869	2,962	1,000
Bundaberg and Gin Gin, Maryborough and Isis. .	20,429	36,205	17,500
Rockhampton.	477	690	. . . . . .

Mackay..	20,194	24,093	16,750
Bowen..	1,613	1,610	2,000
Burdekin....	7,447	10,724	5,500
Herbert.... .... / Johnstone..	21,230	28,692	23,500
Cairns and Port Douglas.	18,295	18,882	18,500
	92,554	120,858	83,750

The decrease for last season was about 37,000 tons of sugar, or a loss of about £400,000. The record output of sugar for the past ten years was realized in 1898, when the yield was 163,734 tons of sugar.

There is much heated discussion in the Australian States just now concerning the not unimportant question as to who is to pay the rebate on white-grown sugar explained above. Is it to be a charge against the Commonwealth as a whole, or is it to come out of the excise duty collected? The Commonwealth Premier is believed to favor the payment of the rebate by Australia on a *per capita* basis, whilst other ministers think that the two States concerned in the production of sugar, Queensland and New South Wales, should liquidate the amount. The fairest view of the matter, I think, is that the Commonwealth should defray the charge; having insisted upon a "White Australia," it should pay the piper. In New South Wales, where about 98 per cent. of cane growers have availed themselves of the rebate system, the question as to whether the burden of payment is to be borne by the State, or Australia as a whole, is a very important one indeed.—*International Sugar Journal.*

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COST OF CANE CULTIVATION IN JAMAICA.

In a recent issue of the Bulletin of the Botanical Department of Jamaica, a carefully prepared statement is made of the cost of cultivation of an estate in Vere, Jamaica, of 400 acres of cane land, divided into three crops, viz., plants, first rattoons and second rattons. The calculations are made by Messrs. J. W. Mitchell and Muirhead. The figures given are in shillings and pence, and by converting the elements of cost into American money by estimating the shillings at 24 cents and the pence at 2 cents each, an excellent idea of the cost of Jamaican cane culture can be had. The comments are made by the editor of the Bulletin.

The elements of cost begin as follows:

Plants, 100 Acres.

	Per Acre.
Preparing land for plough	2s 6d
Close ploughing	6s 0d
Single mould ploughing	5s 0d
Double mould ploughing	3s 0d
Digging row ends	2s 0d
Planting and procuring tops	9s 0d
Covering land in plants	2s 6d
Five cleanings, 4s each	20s 0d
Banking up canes with plough	4s 0d
Booting	5s 0d
Removing dead leaves, trashing	5s 0d
	64s 0d

Ratoons.

Turning, reversing and spreading trash	4s 0d
Rough moulding	2s 0d
Spreading trash and cleaning canes	3s 0d
Booting canes	5s 0d
Thrashing canes	5s 0d
	19s 0d
100 acres plants	£ 320
200 acres ratoons	190
	£ 510
Cane cultivation	£ 510
*Manuring canes, plants 5 cwt., ratoons 2½ cwt., 50 tons at £10	500
Foddering pens—growing cow peas	100
Fences and pastures	60

*The item of £500 for manuring canes is not, in my opinion, justified. That it is not a prevalent agricultural practice is proved by the fact that it represents one-fourth of the total value of fertilizers imported into Jamaica. That it is unnecessary, is brought home to my conviction by recent analyses of Vere soils showing an extraordinary standard of fertility. At present crops are solely limited by the water-supply. If fertilizers were used, the yield per acre should be increased to such an extent as still further to reduce the cost of cane per ton. Eliminating this factor, the cost of cane comes out at 5s 2d per ton instead of 6s 8d, a figure in accord with other data given this district which have been submitted to me. H. H. Cousins.

Cattle men	25
Annual depreciation of live stock	80
Annual depreciation of dead stock	50
Immigration (coolies)	120
Salaries	400
Headmen, watchmen	75
Taxes	80
Interest on working capital	50
Premium on silver, 1 per cent	20
	£2,070

If the canes are to be cut and carried to the factory depot—

Cane cutting, 8s per acre	£ 120	
Carting to depot, 11s	15	
		£135
		£2,205

The cost per acre is thus, £7 7s.

The return may be estimated—

Plants	28 tons per acre.
1st ratoons	20 tons per acre.
2nd ratoons	18 tons per acre.
	66 or 22 tons average per acre.

Cost per ton of canes, 6 6-8 nearly.

No allowance has been made for casualties, such as unusual dry weather reducing crops, heavy winds causing the canes to fall down and rot, heavy rain coming when the canes are well grown and approaching ripeness; perhaps 1s per ton might be added for insurance against these evils—making the total 7s 8d per ton. With regard to cost of cattle and cattle-men—the cattle are supposed to be used for cultivation only, and not for manufacture, otherwise the charge would be about doubled. Out of the 400 acres 100 are supposed to be occupied in preparing the land for ploughing, etc.—the plants to be put in as what are called "fall plants." With spring plant you can gain a cutting but are unable to cultivate the land properly, also the spring plant is much less certain and often requires constant supplying. We have not included irrigation expenses, as they would be about covered by the 1s a ton allowed for casualties, the chief casualty in Vere being dry weather.

Cost of cane cultivation on a ratooning estate in Northern St. James, having 200 acres in cane—average rainfall, 40 inches, according to Mr. J. Shore.

Cultivation of Canefield—

		Per Acre.
Cleaning canes twice		4s 0d
Trashing once.		5s 0d
Supplying with dung		6s 0d
Making and applying manure		20s 0d
		35s 0d
General Expenses—		
Headman and watchmen		5s 0d
Pasture cleaning and fences		8s 0d
Attending stock.		4s 0d
Tradesmen, repairs, etc		3s 0d
Estates' roads and sundries, including trenches, etc.		5s 0d
Cutting and carting canes		15s 0d
Total for labor		75s 0d
Yearly purchase of stock	15s 0d	
Lumber and supplies	4s 0d	
Taxes and rates	4s 0d	
Salaries.	20s 0d	
Sundries, including fertilizers	5s 0d	
		48s 0d
Total cost per acre		123s 0d

The above statement is based on actual figures from estates' books, taking into account the fact that no manufacture is done on the property on which the canes are grown, and that the distance to depot is reasonable. Interest on money is not allowed for, as that is chargeable to the proceeds. No immigration is needed here. Plenty of grass land is kept up from which nearly all the manure is made, only a small proportion being done with fertilizers. One-third of the acreage is manured yearly, part being "fly-penned on the stock," part done by forking in manure, and part supplied with dung, or done with artificial manures, working stock, say 150 head, with perhaps a few young stock penning.

Average return per acre, 18 tons canes; taking into account good and bad years. The cost per ton of cane will thus work out at 6s 10d. Including all expenses except rent.

Of course every district has to work differently: here we cannot do "planting" to any extent owing to the deficient rainfall, but the manuring is kept up all along.

It seems that the cost of cultivation according to Mr. Mitchell's figures is very reasonable, but his allowance for stock is far too low. That is met by the increased cost of manures, which we make on the spot—good farmyard manure. We have plenty of labor and require no coolies, as cane is about the only dependence of the people here. The cost per ton of cane is very near in both cases. It may be said that my estimate of salaries is too low, but it must be taken into account that the present salaries are paid for manufacturing and shipping as well as for cultivation. A proportion of the salary item will have to go to the factory account. Otherwise the details in my statement are actual figures as at present.

This memo refers to one estate of 200 acres which makes nearly all its own manure (and of course to estates of similar size and position). The figures given to the Conference were rather higher, being 7s 3d per ton of cane instead of 6s 10d here, owing to the statistics being collected from five estates not altogether and of different sizes, averaging 180 acres of cane each, some of which allowed for more artificial manure. It is of course a fact that the larger area of cane land under one management, the cheaper the cost of production, so that five estates averaging 200 acres each would total 1,000 acres instead of 900 in the Conference figures and make a difference in the results.

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COMMERCIAL CONVENTION WITH CUBA.

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The President of the United States of America and the President of the Republic of Cuba, animated by the desire to strengthen the bonds of friendship between the two countries, and to facilitate their commercial intercourse by improving the conditions of trade between them, have resolved to enter into a convention for that purpose, and have appointed their respective Plenipotentiaries, to-wit:—

The President of the United States of America, the Honorable General Tasker H. Bliss.

The President of the Republic of Cuba, the Honorable Carlos de Zaldo y Beurmann, Secretary of State and Justice, and the Honorable Jose M. Garcia y Montes, Secretary of the Treasury; who, after an exchange of their full powers found to be in good and due form, have, in consideration of and in compensation for the respective concessions and engagements made by each to the other as hereinafter recited, agreed and do hereby agree upon the following Articles for the regulation and government of their reciprocal trade, namely:—

Article I.—During the term of this convention, all articles of merchandise being the product of the soil or industry of the United States which are now imported into the Republic of Cuba free of duty, and all articles of merchandise being the product of the soil or industry of the Republic of Cuba which are now imported into the United States free of duty, shall continue to be so admitted by the respective countries free of duty.

Article II.—During the term of this convention, all articles of merchandise not included in the foregoing Article I and being the product of the soil or industry of the Republic of Cuba imported into the United States shall be admitted at a reduction of twenty percentum of the rates of duty thereon as provided by the Tariff Act of the United States approved July 24, 1897, or as may be provided by any tariff law of the United States subsequently enacted.

Article III.—During the term of this convention, all articles of merchandise not included in the foregoing Article I and not hereinafter enumerated, being the product of the soil or industry of the United States, imported into the Republic of Cuba shall be admitted at a reduction of twenty percentum of the rates of duty thereon as now provided or as may hereafter be provided in the Customs Tariff of said Republic of Cuba.

Article IV.—During the term of this convention, the following articles of merchandise as enumerated and described in the existing Customs Tariff of the Republic of Cuba, being the product of the soil or industry of the United States imported into Cuba shall be admitted at the following respective reductions of the rates of duty thereon as now provided or as may hereafter be provided in the Customs Tariff of the Republic of Cuba:—

Schedule A.—To be admitted at a reduction of Twenty-five (25) percentum:—

Machinery and apparatus of copper or its alloys or machines and apparatus in which copper or its alloys enter as the component of chief value, cast iron, wrought iron and steel, and manufactures thereof; articles of crystal and glass, except window glass; cotton and manufactures thereof now classified under Paragraphs 114 and 116 of the Customs Tariff of the Republic of Cuba; ships and water borne vessels of all kinds, of iron or steel; whiskies and brandies; fish, salted, pickled, smoked or marinated; fish or shell fish, preserved in oil or otherwise in tins; articles of pottery or earthenware now classified under Paragraphs 21 and 22 of the Customs Tariff of the Republic of Cuba.

Schedule B.—To be admitted at a reduction of Thirty (30) percentum:—

Butter; chemical and pharmaceutical products and simple drugs; malt liquors in bottles; non-alcoholic beverages; cider;

mineral waters; colors and dyes; window glass; complete or partly made up articles of hemp, flax, pita, jute, henequen, ramie, and other vegetable fibers now classified under the paragraphs of Group 2, Class V, of the Customs Tariff of the Republic of Cuba; musical instruments; writing and printing paper, except for newspapers; cotton and manufactures thereof, except those now classified under Paragraphs 114 and 116 of the Customs Tariff of the Republic of Cuba (see Schedule A) and except knitted goods (see Schedule C); all articles of cutlery; boots, shoes and slippers, now classified under Paragraphs 197 and 198 of the Customs Tariff of the Republic of Cuba; gold and silver plated ware; drawings, photographs, engravings, lithographs, cromolithographs, oleographs, etc., printed from stone, zinc, aluminium, or other material, used as labels, flaps, bands and wrappers for tobacco or other purposes and all the other papers (except paper for cigarettes, and excepting maps and charts), pasteboard and manufactures thereof, now classified under Paragraphs 157 and 164 inclusive of the Customs Tariff of the Republic of Cuba; common or ordinary soaps, now classified under Paragraph 105, letters "A" and "B," of the Customs Tariff of the Republic of Cuba; vegetables, pickled or preserved in any manner; all wines, except those now classified under Paragraph 279 (a) of the Customs Tariff of the Republic of Cuba.

Schedule C.—To be admitted at a reduction of Forty (40) percentum:—

Manufactures of cotton, knitted, and all manufactures of cotton not included in the preceding schedules; cheese; fruits, preserved; paper pulp; perfumery and essences; articles of pottery and earthenware now classified under Paragraph 20 of the Customs Tariff of the Republic of Cuba; porcelain; soaps, other than common, now classified under Paragraph 105 of the Customs Tariff of the Republic of Cuba, umbrellas and parasols; dextrine and glucose; watches; wool and manufactures thereof; silk and manufactures thereof; rice; cattle.

Article V.—It is understood and agreed that the laws and regulations adopted, or that may be adopted, by the United States and by the Republic of Cuba, to protect their revenues and prevent fraud in the declarations and proofs that the articles of merchandise to which this convention may apply are the product or manufacture of the United States and the Republic of Cuba, respectively, shall not impose any additional charge or fees therefor on the articles imported, excepting the consular fees established, or which may be established, by either of the two countries for issuing shipping documents, which fees shall not be higher than those charged on the shipments of similar merchandise from any other nation whatsoever.

Article VI.—It is agreed that the tobacco, in any form, of the United States or of any of its insular possessions, shall not enjoy the benefit of any concession or rebate of duty when imported into the Republic of Cuba

Article VII.—It is agreed that similar articles of both countries shall receive equal treatment on their importation into the ports of the United States and of the Republic of Cuba, respectively.

Article VIII.—The rates of duty herein granted by the United States to the Republic of Cuba are and shall continue during the term of this convention preferential in respect to all like imports from other countries, and, in return for said preferential rates of duty granted to the Republic of Cuba by the United States, it is agreed that the concession herein granted on the part of the said Republic of Cuba to the products of the United States shall likewise be, and shall continue, during the term of this convention, preferential in respect to all like imports from other countries: Provided that while this convention is in force no sugar imported from the Republic of Cuba, and being the product of the soil or industry of the Republic of Cuba, shall be admitted into the United States at a reduction of duty greater than twenty percentum of the rates of duty thereon as provided by the tariff act of the United States approved July 24, 1897, and no sugar, the product of any other foreign country, shall be admitted by treaty or convention into the United States, while this convention is in force, at a lower rate of duty than that provided by the tariff act of the United States approved July 24, 1897.

Article IX.—In order maintain the mutual advantages granted in the present convention by the United States to the Republic of Cuba and by the Republic of Cuba to the United States, it is understood and agreed that any tax or charge that may be imposed by the national or local authorities of either of the two countries upon the articles of merchandise embraced in the provisions of this convention, subsequent to importation and prior to their entering into consumption in the respective countries, shall be imposed and collected without discrimination upon like articles whensoever imported.

Article X.—It is hereby understood and agreed that in case of changes in the tariff of either country which deprive the other of the advantage which is represented by the percentages herein agreed upon, on the actual rates of the tariffs now in force, the country so deprived of this protection reserves the right to terminate its obligations under this convention after six months' notice to the other of its intention to arrest the operations thereof.

And it is further understood and agreed that if, at any time during the term of this convention, after the expiration of the first year, the protection herein granted to the products and manufactures of the United States on the basis of the actual rates of the tariff of the Republic of Cuba now in force, should appear to the government of said Republic to be excessive in view of a new tariff law that may be adopted by it after this convention becomes operative, then the said Republic of Cuba may reopen negotiations with a view to securing such modifications as may appear proper to both contracting parties.

Article XI.—The present convention shall be ratified by the appropriate authorities of the respective countries, and the ratifications shall be exchanged at Washington, District of Columbia, United States of America, as soon as may be before the thirty-first day of January, 1903, and the convention shall go into effect on the tenth day after the exchange of ratifications and shall continue in force for the term of five (5) years from date of going into effect, and from year to year thereafter until the expiration of one year from the day when either of the contracting parties shall give notice to the other of its intention to terminate the same.

Provided that this Treaty shall not take effect until the same shall have been approved by the Congress of the United States.

In witness whereof we, the respective Plenipotentiaries, have signed the same in duplicate, in English and Spanish, and have affixed our respective seals, at Havana, Cuba, this eleventh day of December, in the year one thousand nine hundred and two.

	Tasker H. Bliss	(Seal.)
Seal.	Carlos De Zaldo	(Seal.)
Republic of Cuba.	Jose M. Garcia Montes	(Seal.)
Ministry of State and Justice.		

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PROPOSED SUGAR TRUST IN SPAIN.

After the loss of the island of Cuba, attention was turned to the possibility of producing beet sugar on an extensive scale in Spain. The prospect of a lucrative investment attracted capital, and large factories were erected and wide tracts of country were devoted to the cultivation of the beet. Overproduction quickly ensued, and stocks of sugar have been accumulating year by year, with little probability of any improvement in the condition of the trade or chance of the surplus being disposed of in foreign markets. Manufacturers of cane and beet sugar have, therefore, decided to endeavor to form a trust to control the production and regulate the sale of sugar in this country. Negotiations have been going on for some months, but thus far with no tangible result, al-though according to the latest reports 90 per cent of the sugar manufacturers have joined the combination.

It is feared by many that the ultimate aim may be the securing of a monopoly for the sale of sugar, in return for a yearly payment to the State, as it is argued that the success of the trust depends entirely upon some security against future tariff alterations. It is this fear that has aroused a widespread opposition to the proposal, and strong protests are being sent to Madrid from all parts of Spain. The manufacturers of products into which sugar largely enters are especially interested in preventing the price from being increased, and the general public, who now pay the equivalent of about 10 cents per pound for ordinary loaf sugar, do not view with favor a scheme which will probably result in enhancing the cost of this article. On the other hand, those who are working for the formation of the trust maintain that their object is not to increase but to cheapen the cost of sugar by selling direct to the consumers. They point out that while the public is paying 140 to 150 pesetas ($19.99 to $21.42) per 100 kilograms (220.46 pounds), the dealers are buying from the mills at 95 to 100 pesetas ($13.56 to $14.28), and that the large margin of profit here shown might be divided between the trust and the public. Foreign sugar under the present tariff costs here 120 pesetas ($17.13) per 100 kilograms, but the trust, they say, would be able to advantageously supply the consumer at the price of 115 pesetas ($16.42).—Consular Reports.

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FLUCTUATIONS OF PRICES OF RAW SUGAR, APRIL 12 TO MAY 11.

Centrifugals				Beets			
1903		1902		1903		1902	
April 12..	3.51	April 14 .	3.375	April 12	8s 3 d	April 14	6s 4½d
" 14..	3.57						
" 17..	3.625			" 14	8s 2¼d		
" 20..	3.63	" 21..	3.375	" 15	8s 3 d	" 2	6s ¾d
" 21..	3.695			" 16	8s 3¾d		
" 22..	3.73			" 17	8s 4½d		
" 23..	3.695	" 25..	3.375	" 18	8s 5¼d	" 28	6s 3 d
" 24..	3.6875			" 22	8s 4½d		
" 25..	3.695			" 28	8s 3¾d		
				" 30	8s 3 d		
				May 1...	8s 4½d		
				" 6..	8s 3¾d		
May 11....	3.695	May 5.....	3.50	" 11...	8s 4½d	May 5...	6s 3¾d

PLANTATION DIRECTORY.

ISLAND AND NAME.		MANAGER.	POST OFFICE.
OAHU.			
Apokaa Sugar Co.	*	G. F. Renton	Ewa
Ewa Plantation Co.	*	G. F. Renton	Ewa
Waianae Co.	***	Fred Meyer	Waianae
Waialua Agricultural Co.	*	W. W. Goodale	Waialua
Kahuku Plantation Co.	x*	Andrew Adams	Kahuku
Waimanalo Sugar Co.	**	G. C. Chalmers	Waimanalo
Oahu Sugar Co.	x	Aug. Ahrens	Waipahu
Honolulu Plantation Co.	**	J. A. Low	Aiea
Laie Plantation	x*x	S. E. Wooley	Laie
MAUI.			
Olowalu Co.	**	Geo. Gibb	Lahaina
Pioneer Mill Co.	x	L. Barkhausen	Lahaina
Wailuku Sugar Co.	**x	C. B. Wells	Wailuku
Hawaiian Commercial & Sug. Co.	x*	H. P. Baldwin	Puunene
Paia Plantation	x*	D. C. Lindsay	Paia
Haiku Sugar Co.	x*	H. A. Baldwin	Hamakuapoko
Hana Plantation	xx	E. K. BULL	Hana
Kipahulu Sugar Co.	x	A. Gross	Kipahulu
Kihei Plantation Co.	x*	James Scott	Kihei
Maui Sugar Co.	x**	J. R. Myers	Huelo
HAWAII.			
Paauhau Sugar Plantation Co.	**	Jas. Gibb	Hamakua
Hamakua Mill Co.	*x	A. Lidgate	Paauilo
Kukaiau Plantation	x	J. M. Horner	Paauilo
Kukaiau Mill Co.	*x	E. Madden	Paauilo
Ookala Sugar Co.	**x	W. G. Walker	Ookala
Laupahoehoe Sugar Co.	*x	C. McLennan	Papaaloa
Hakalau Plantation	**	Geo. Ross	Hakalau
Honomu Sugar Co.	**x	Wm. Pullar	Honomu
Pepeekeo Sugar Co.	*x	H. Deacon	Pepeekeo
Onomea Sugar Co.	**x	J. T. Moir	Papaikou
Hilo Sugar Co.	**	J. A. Scott	Hilo
Hawaii Mill Co.	x	W. von Graevemeyer	Hilo
Waiakea Mill Co.	*x	C. C. Kennedy	Hilo
Hawaiian Agricultural Co.	**x	John Sherman	Pahala
Hutchinson Sugar Plantation Co.	**	G. C. Hewitt	Naalehu
Union Mill Co.	*x	Jas. Renton	Kohala
Kohala Sugar Co.	*	E. E. Olding	Kohala
Pacific Sugar Mill	x**	D. Forbes	Kukuihaele
Honokaa Sugar Co.	x**	K. S. Gjerdrum	Honokaa
Kona Sugar Co.	xxx		Holualoa
Olaa Sugar Co.	xx*	F. B. McStocker	Olaa
Puna Sugar Co.	xx*	W. H. Campbell	Kapoho
Halawa Plantation	x*x	T. S. Kay	Kohala
C. F. Hart, (Niulii)	*x	R. Hall	Kohala
Hawi Mill & Plantation	‡‡	John Hind	Kohala
Puako Plantation	‡‡	W. L. Vredenburg	Kawaihae
KAUAI.			
Kilauea Sugar Plantation Co.	**	A. Moore	Kilauea
Gay & Robinson	x*x	Gay & Robinson	Makaweli
Makee Sugar Co.		G. H. Fairchild	Kealia
Grove Farm Plantation	x	G. N. Wilcox	Lihue
Lihue Plantation Co.	x	F. Weber	Lihue
Koloa Sugar Co.	x	P. McLane	Koloa
McBryde Sugar Co.	*x	W. Stodart	Eleele
Hawaiian Sugar Co.	x*	W. A Baldwin	Makaweli
Waimea Sugar Mill Co.	*	J. Fassoth	Waimea
Kekaha Sugar Co.	x	H. P. Faye	Kekaha

KEY.	HONOLULU AGENTS.	
*	Castle & Cooke	(4)
**	W. G. Irwin & Co.	(8)
***	J. M. Dowsett	(1)
x	H. Hackfeld & Co.	(9)
xx	M. S. Grinbaum & Co.	(2)
xxx	McChesney & Sons	(1)
*x	T. H. Davies & Co.	(8)
**x	C. Brewer & Co.	(7)
x*	Alexander & Baldwin	(5)
x**	F. A. Schaefer & Co.	(3)
xx*	B. F. Dillingham & Co.	(2)
x*x	H. Waterhouse & Co.	(3)
‡‡	Hind, Rolph & Co.	(1)

HONOLULU STOCK AND BOND EXCHANGE, JUNE 25, 1903.

STOCK	Capital Authorized	Shares Issued	Capital Paid up	Par Value	Last Sale
MERCANTILE					
C. Brewer & Co.............	$ 1,000,000	10,000	$ 1,000,000	$ 100	390
L. B. Kerr & Co., Ltd.......	200,000	4,000	....	50	
SUGAR					
Ewa Plantation Company ...	5,000,000	250,000	5,000,000	20	21
Hawaiian Agricultural Co...	1,000,000	10,000	1,000,000	100	245
Hawaiian Com'l & Sugar Co.	10,000,000	100,000	2,312,750	100	45
Hawaiian Sugar Company...	2,000,000	100,000	2,000,000	20	24
Honomu Sugar Company...	750,000	7,500	750,000	100	105
Honokaa Sugar Company ...	2,000,000	100,000	2,000,000	20	13¾
Haiku Sugar Company......	500,000	5,000	500,000	100	100
Kahuku Plantation Company	500,000	25,000	500,000	20	22
Kihei Plant. Co. Ltd., ...	2,500,000	50,000	2,500,000	50	8
Kipahulu Sugar Company...	160,000	1,600	160,000	100	.....
Koloa Sugar Company......	500,000	5,000	500,000	100	164
McBryde Sug. Co. Ltd.......	3,500,000	175,000	3,500,000	20	4
Oahu Sugar Co............	3,600,000	36,000	3,600,000	100	102
Onomea Sugar Co	1,000,000	50,000	1,000,000	20	23½
Ookala Sugar Plantation Co.	500,000	25,000	500,000	20	10½
Olaa Sugar Co. Ltd., ...	5,000,000	250,000	5,000,000	20	7½
Olowalu Company	150,000	1,500	150,000	100	.....
Paauhau Sug. Plantation Co.	5,000,000	100,000	5,000,000	50	12
Pacific Sugar Mill	500,000	5,000	500,000	100	.....
Paia Plantation Company ...	750,000	7,500	750,000	100	250
Pepeekeo Sugar Company...	750,000	7,500	750,000	100	.....
Pioneer Mill Company......	2,250,000	22,500	2,250,000	100	100
Waialua Agricultural Co....	4,500,000	45,000	4,500,000	100	50
Wailuku Sugar Company....	700,000	7,000	700,000	100	300
Waimanalo Sugar Company	250,000	250,000	250,000	100	160
MISCELLANEOUS					
Wilder Steamship Company	500,000	5,000	500,000	100	100
Inter-Island Steam Nav. Co..	600,000	6,000	600,000	100	112½
Hawaiian Electric Company.	500,000	5,000	500,000	100	100
Honolulu R. T. & Land Co...	250,000	2,500	250,000	100	80
Mutual Telephone Company	150,000	13,900	139,000	10	10
Oahu Railway & Land Co ...	4,000,000	40,000	4,000,000	100	90
BONDS	Amt. of Issue				
Hawaiian Govt. 5 per cent...	1,251,200	Dec. 31, 1900	....	.....	98
Hilo Railroad Co., 6 per cent	1,000,000	750,000	....	.....	100
Hono. R. T. & L. Co , 6 p. c.	300,000	....	....	.....	100
Ewa Plantation 6 per cent...	500,000	....	....	.....	100
Oahu Railway & L'd Co. 6 p. c.	2,000,000	....	....	.....	103½
Oahu Plantation 6 per cent..	750,000	....	....	.....	100¼
Olaa Plantation 6 per cent ..	1,250 000	....	....	.....	.....
Waialua Agr. 6 per cent.....	1,000,000	....	....	.....	100¼
Kahuku 6 per cent	200,000	....	....	.....	101
Pioneer Mill Co., 6 per cent	1,250,000	....	....	.....	100